STUDIES FROM THE

ANTHROPOLOGICAL LABORATORY

London: C. J. CLAY AND SONS,
CAMBRIDGE UNIVERSITY PRESS WAREHOUSE,
AVE MARIA LANE,

AND

H. K. LEWIS,
136, GOWER STREET, W.C.

Glasgow: 50, WELLINGTON STREET.
Leipzig: F. A. BROCKHAUS.
New York: THE MACMILLAN COMPANY.
Bombay and Calcutta: MACMILLAN AND CO., LTD.

STUDIES FROM THE ANTHROPOLOGICAL LABORATORY THE ANATOMY SCHOOL CAMBRIDGE

by

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CAMBRIDGE.
at the University Press
1904

67269

Cambridge
PRINTED BY J. AND C. F. CLAY
AT THE UNIVERSITY PRESS.

TO

ALEXANDER MACALISTER,

M.D., F.R.S., LL.D.,

PROFESSOR OF ANATOMY

IN THE UNIVERSITY OF CAMBRIDGE.

PREFACE.

THE following studies may be conveniently classified under four headings, viz.

I. Introductory account of the University Anatomical Museum at Cambridge and its contents. This forms the subject of the first essay.

II. Contributions to the Morphology of Man and the Primates. Under this heading come Nos. 2 to 16 inclusive.

III. Craniological descriptions of specimens in the University Anatomical Museum at Cambridge. Under this heading come Nos. 17 to 33 inclusive.

IV. The remaining three studies may be grouped together as miscellaneous contributions to Human Morphology and to Physical Anthropology.

While many of the studies have already been published, Nos. 11, 12, 13, 15, 16, 32 and 36, with many figures, now appear for the first time. For permission to reprint the other communications in their present form, my warm thanks are due to the Council of the Anatomical Society (for No. 5); the Council of the Zoological Society (for Nos. 7 and 8); the Council of the Cambridge Philosophical Society (for Nos. 3, 34 and 35); the Council of the Anthropological Institute (for Nos. 17—31 incl.); the Council of the Cambridge Antiquarian Society (for No. 33); the Editors of the *Journal of Anatomy and Physiology* (for Nos.

2, 4, 6, 9, 13); and the Central Committee of the International Congress of Prehistoric Archaeology and Anthropology (for No. 10).

My thanks are also due to the Syndicate and Staff of the University Pitt Press, to whom I readily acknowledge my indebtedness.

It is hoped that the present volume may be the first of a series dealing with the extremely rich collections contained in the Anatomical Museum at Cambridge. It remains only to add that Professor Macalister has consented to accept the dedication of this tribute, such as it is, to his indefatigable energy and enthusiasm for anthropological studies.

W. L. H. D.

JESUS COLLEGE,
CAMBRIDGE.
August 27, 1904.

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TABLES.

THE ANTHROPOLOGICAL COLLECTION IN THE MUSEUM OF HUMAN ANATOMY, CAMBRIDGE.

THE Anthropological Collection occupies ten cases in the Museum of Human Anatomy, wall-cases being arranged round the sides of that room, in addition to five spacious central cases. The contents of these cases represent the results of the efforts of Professor Macalister and his predecessor in the Chair of Human Anatomy, the late Sir George M. Humphry, to bring together a thoroughly representative series of the crania of the various human races. With such success have those efforts been met that the collection is second to none in this country, and comprises more than one subsidiary series—*e.g.*, the Thurnam and the Hutchinson Collections—of very considerable magnitude.

The very number of the specimens, however, renders the acquisition of a comprehensive knowledge of the contents of this Museum a matter of prolonged study, and it is with the idea of pointing out the rarer and more interesting examples that these notes have been brought together. At the same time, references are given to various periodicals in which certain portions of the Collection may be found described in detail.

It is convenient to describe the specimens in the order of the cases in which they are contained, and a rough sketch-plan of the Museum is appended in which the cases are marked with numerals from 1—10.

Thus, on entering the Museum, there will be found immediately to the left, a wall-case (No. 1)[1], containing (besides some bones of the skeleton possessing no special anthropological importance) a series of modern European crania, of which the following are the most interesting:—

(*a*) Two skulls of Finlanders presented by Professor Retzius. The interest of these specimens lies in the fact that there has been a

[1] These specimens have recently been removed to Case No. 7 (see plan on p. 10). W. L. H. D., 1904.

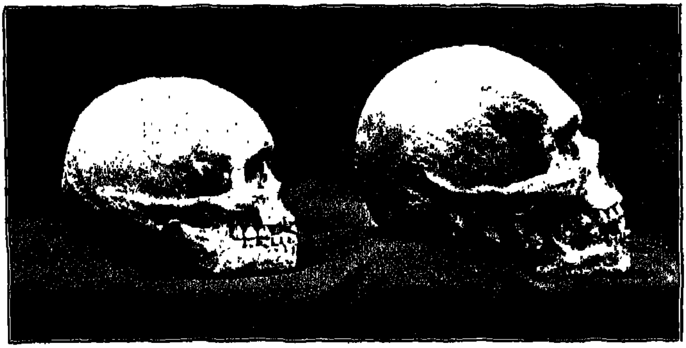
difficulty in determining the precise relationship of the Finns to other European nations, some Mongolian affinities having been suspected.

(*b*) The skulls of Lapps are also of interest in consideration of the obscure relations of that race; and the similarity of these skulls to certain crania of Savoyard origin is marked.

(*c*) A cast of the cranium of King Robert Bruce will be found here; and that the statement repeated by various authors as to the Neanderthaloid characters presented by it rests on a slender basis, will be seen on

(*a*) Aboriginal Australian (2115). (*b*) Aboriginal Tasmanian (2096).
Fig. 1.

reference to the next case, No. 2, which stands beyond the wall-case containing the preceding specimens, and contains plaster models of the



(*a*) *Female* (3342). (*b*) *Male* (3324).
Fig. 2.—Natives of New Britain (*Willey Coll.*).

crania of some of the classical examples of Prehistoric man; among which will be found the following, referable to Palæolithic man—viz., the Neanderthal, Spy, and Engis crania; and of those of later date, the Cro-Magnon skull (early Neolithic period). Furthermore there is a cast of the calvaria found by Dr Dubois in the Pliocene strata of Trinil, Java; it is attributed by its discoverer to a form known as *Pithecanthropus erectus*, which is justifiably supposed to represent a precursor of Man. A cast (2101) shows the cranium of an Australian aboriginal with some very pithecoid features.

Turning back from case No. 2 towards the door there will be found a case (No. 3) containing a variety of skulls, of which the following are on that aspect of this case facing the door:—

(*a*) The crania of aborigines of Tasmania (a race now extinct; cf. Nos. 2096–2100); and in close proximity to these,

(*b*) The crania of Australian aborigines—Nos. 2101–2114 (for crania of Tasmanian and Australian aborigines see fig. 1); with the latter are three specially prepared heads of Australian natives, showing the wavy (not woolly) nature of the hair, and the plentiful beard; No. 2115 (cf. fig. 1) shows an extreme degree of prognathism, a character very constant in aboriginal Australians.

(*c*) Melanesian crania, especially the "Willey Collection" (brought to Cambridge by A. Willey, Esq., M.A., late Balfour Student), from the Melanesian islands of New Britain and Lifu, occupy much of the remaining space on this aspect of case No. 3. The following are points of interest in connection with this (otherwise) very homogeneous group: (i) the great difference sometimes met with in the crania of the two sexes (cf. fig. 2, crania Nos. 3342 and 3324); while in other instances the difficulty (so marked in the case of the crania of African negro races) of assigning the correct sex to a skull, occurs; (ii) notice the specimen No. 3324 (cf. fig. 2), for besides its generally massive character, it is peculiar in having an erupted and displaced fragment of a tooth on the margin of the nasal aperture. No. 3384 shows a similar condition.

The foregoing (New Britain) specimens may be regarded as typical examples of the Oceanic-negro race.

(*d*) With the preceding may be contrasted skulls of Polynesian origin, as represented by the Kanakas (ref. 1), by the skulls brought by J. S. Gardiner, Esq. (Fellow of Caius College), from the island of Rotuma (see fig. 3, and Nos. 1809–1817), and by the well-authenticated series of ten crania of the Mori-ori, a people formerly inhabiting the Chatham Islands, but now practically extinct. It must be admitted that authors are not entirely in agreement as to the affinities of the Mori-ori. The contrast in skull form is one of a series whereby the

Polynesians are distinguished from their Melanesian neighbours; it must not be forgotten that many intermediate forms are met with. By taking extremes, the Polynesian skull is distinguished from the Melanesian by its greater capacity, greater breadth, greater parietal eminences, less massive brow-ridges, and higher orbits.

The Polynesian group contains three skulls of Maories, and four crania from Raiatea, but otherwise is not so complete as the Melanesian series. The next specimens worthy of note are three crania from Madagascar (Nos. 1783, 1785), representing two of the cranial forms met with in that island, whereof one is a modification of the skull form commonly found among the Bantu races of Africa. The African skulls will be found on that aspect of this case (No. 3) furthest removed from the door, and comprise examples of 'West Coast' negroes, of Kaffirs, of the Bush and Hottentot races of the Cape (refs. 3, 4, 5), of Central African negroes, and the specimens from the battlefield of Tel-el-Kebir. The latter, which we owe to the interest of Messrs Leigh-Smith and Green, of Jesus College, include certainly two crania referable

Fig. 3.—Native of Rotuma (*Gardiner Coll.*).
(1814).

to a negro origin, although others of the series are skulls of Egyptian Fellaheen. The collection of African skulls has been further augmented by the Guanche crania from Teneriffe (ref. 6), and by the enormous collection of crania of inhabitants of Egypt (ref. 9), ancient and modern, which will be mentioned later. But the case under consideration also contains crania from Syria (notice the specimen 1237 for

an example of occipital flattening probably of artificial origin), of Jews (probably from Holland), and a fine series of crania of Punjabis, presented by Dr Havelock Charles, and described by Professor Macalister, assisted by Messrs E. M. Corner and R. J. Horton-Smith (ref. 7).

The two skulls (Nos. 1204 and 1205) from Nagyr in the Gilgit district of Central Asia may be noticed. These rare specimens were obtained by Sir W. M. Conway during his exploration of the mountain peaks of the Himalaya and Hindu-Kush. They are undoubtedly of Caucasian type, and present no trace of Mongolian features; herein they afford contrast with cranial forms to be met with further east, *e.g.*, in Ladakh, and in Eastern Turkestan (cf. a skull from the Macartney Collection deposited in this Museum). Lastly, a skull from Kamschatka may be referred to as exemplifying a race but seldom represented in collections (cf. ref. 13). Case No. 4 is entirely occupied by Egyptian crania, among which will be found representatives of the inhabitants of Egypt under the Dynasties v. and xviii., also of the date of the Roman occupation, and lastly Egyptians of modern times. For these specimens the University is indebted to Professors Budge and Flinders Petrie, as well as to F. W. Green, Esq., M.A., of Jesus College. The

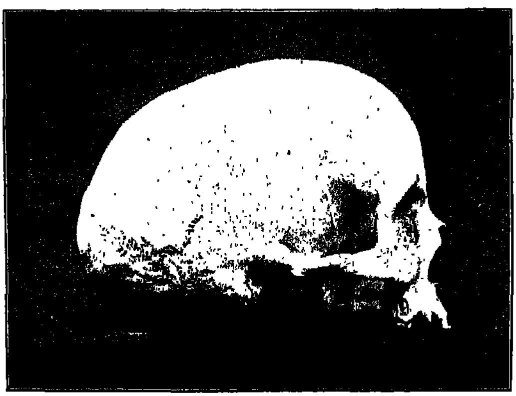


Fig. 4.—Egyptian.

whole series has for some time past been under examination by Professor Macalister, though the results of the investigation have not yet been made available. The example of Egyptian cranium, represented in fig. 4, exemplifies the condition known as scaphocephaly, since the cranial vault is here found to have assumed a keel-shape or scaphoid form.

The contents of the long case (No. 5) running down the centre of the Museum are a number of skeletons, of which those of aboriginal

Australians (at the end nearest the window) are noteworthy, No. 25 showing the form of pelvis (compressed laterally) met with in males of this race. With this pelvic form may be contrasted that of the Eskimo woman (No. 1873). The origin of the two skeletons of individuals of the Bush race of South Africa is not exactly known, but they present features not altogether typical of that race (for the skulls of which cf. specimens No. 1738 *et seq.* in case No. 3). Of the remaining skeletons that of Madame Barré[1] is worth notice; then follow skeletons of East Anglians from near Cambridge, and lastly a most valuable specimen—viz., the skeleton of an individual of the Long Barrow race, which is referred to the Neolithic period in this country. This skeleton forms part of the well-known Thurnam Collection, which was secured for the University by Professor Humphry, and which comprises a large series of crania of the inhabitants of Britain from the Neolithic period onwards.

In the case No. 6 will be found another great collection of skulls of Egyptians, chiefly of the periods following: Dynasty xii. (Memphis,

Fig. 5.—Peruvian (*Hutchinson Coll.*).

Nos. 1254–1362, Aswān, Nos. 1364–1459, Qurnah, Nos. 1509–1510), and Dynasty xxii. (Balsamum near Deshasheh, Nos. 3141–3258), and

[1] "Madame Barré, a distinguished French lady, who bequeathed her body to me."—Macartney. (Descriptive notes of the Macartney Collection.) This skeleton is therefore evidently not that of Madame Barry, the famous actress of the eighteenth century and rival of Mrs Siddons.

with these two or three mummified heads may be observed, *e.g.* that of a lady with hair of an unusual degree of blondness; those of a physician, and a priest; as was evidenced by the characters on the wrappings and casings which have been removed.

In the case No. 7 will be found (on the aspect facing the door) the extensive Hutchinson Collection of crania of Peruvians (cf. fig. 5), of which some (No. 1987) show the effects of cranial deformation in a marked degree. With these are arranged a few prehistoric crania from Jamaica, presenting forms and deformations not unlike the preceding examples. In the same case are a number of crania of the Eskimo from Greenland and from Labrador, for some of which the University is indebted to Dr Curwen, of St John's College (fig. 6).

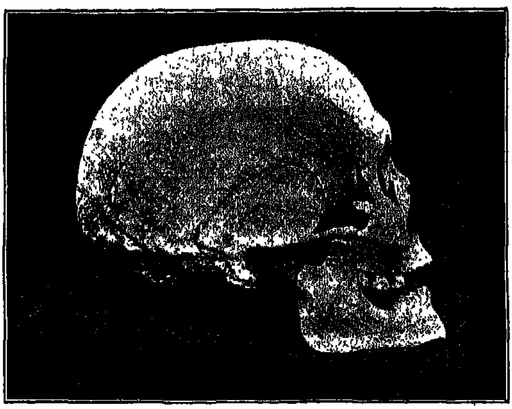


Fig. 6.—Eskimo (1832).

Lastly, there may be noticed a series of crania from Vancouver's Island and British Columbia (which also illustrate the effects of artificial modification of cranial form in infancy), and a few skulls of North American Indians. On the further side of the same case are placed the crania of inhabitants of the British Isles, and here many specimens of the Thurnam Collection will be found (notice No. 551 as an example of the Saxon type of cranium and No. 468 as that of a Briton). These crania may well be considered in connection with the contents of the large wall-case No. 9, in which will be found representatives of several classical epochs in the history of human culture in this land. Thus we find the Long Barrow race (already mentioned as referable to the Neolithic period), with characteristically long narrow skull and countenance. To this succeeds the Round Barrow race with broad round

skull and broader countenance. This becomes merged in the British race of the Roman Conquest, and the latter in the Saxon and Anglian types, to which the crania found at Brandon (and recognisable by the dark brown staining they have received from the soil) seemed to be referable as local varieties. A few Saxon crania from Goring will be found in the small wall-case (10) (note No. 666 and cf. ref. 10).

There remain the contents of the wall-case 8, which immediately faces the doorway. This case is devoted to examples presenting conformations that depart from the ordinary or normal type (refs. 14, 15). There may be noticed the presence of a large wormian bone at the lambda (os incae, from its supposed confinement to skulls of that race) in both English and Peruvian crania. Division of the malar bone is seen in skulls of an East Anglian and a Peruvian respectively. Pressure deformations of artificial origin are seen in the crania of a Vancouver islander, an Avar, and a native of Mallicollo respectively, the latter two being very similar; lastly an example of native trephining may be noticed—viz., No. 1904, with which compare the New Britain cranium No. 3340 in case 3.

In the end bay-case of No. 8 are placed crania of the bathrocephalic, akrocephalic, scaphocephalic, and hydrocephalic varieties; whereof the latter three may be ascribed to defective growth of the cranium, and with these may be compared two examples of microcephalic crania.

Professor Macalister has quite recently completed the arrangement of a new case in the 'Bone-room' of the Museum for the exhibition of specimens illustrating Kollmann's 'types,' and certain cranial abnormalities; of the latter, No. 2286 presents the characteristics of the microcephalic skull in a very marked degree (ref. 12).

It may be repeated, in conclusion, that the present account deals with a mere selection of some of the most interesting of the specimens, which are now numbered by thousands. In addition to those described in the present volume the following references to descriptions of specimens in the Museum are appended.

1. KANAKAS.—Prof. Alex. Macalister, F.R.S., *Jour. of Anat. and Phys.*, Jan. 1898.

2. ROTUMA.—J. S. Gardiner, M.A., *Jour. of the Anthrop. Inst.*, Oct. 1898. (Describes how the skulls were obtained.)

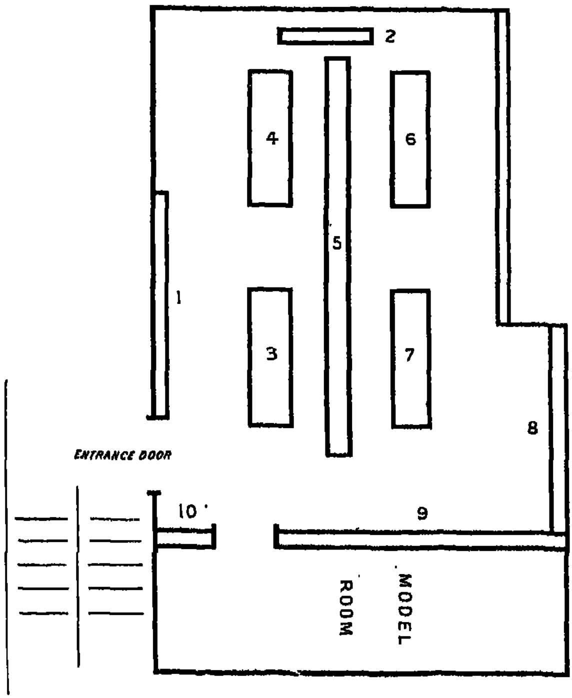
3. SOUTH AFRICAN CRANIA.—F. Shrubsall, B.A., *Jour. of the Anthrop. Inst.*, Nov. 1898.

4. CRANIA OF BUSH RACES.—F. Shrubsall, B.A., *Jour. of the Anthrop. Inst.*, 1897.

5. CRANIA FROM ASHANTI.—F. Shrubsall, B.A., *Jour. of the Anthrop. Inst.*, Nov. 1898.

6. GUANCHE CRANIA.—F. Shrubsall, B.A., *Proc. Camb. Phil. Soc.*, vol. ix., part 3.
7. PUNJABI AND BENGALI CRANIA.—Prof. Macalister, E. M. Corner, R. J. Horton-Smith, M.A., *Proc. Camb. Phil. Soc.*, Apr. 29, 1895.
8. MOOR CRANIA FROM CEYLON.—E. M. Corner, M.A., *Jour. of Anat. and Phys.*, July 1898.
9. EGYPTIAN CRANIA.—W. S. Melsome, M.D. (unpublished).
10. SAXON CRANIA.—R. J. Horton-Smith, M.A., *Jour. of the Anthrop. Inst.*, Nov. 1896.
11. BRANDON CRANIA.—C. S. Myers, B.A., *Jour. of the Anthrop. Inst.*, Nov. 1896.
12. MICROCEPHALIC CRANIUM.—Rev. C. Kempson, M.A., *Jour. of Anat. and Phys.*, Jan. 1898.
13. CRANIUM FROM KAMSCHATKA.—Prof. Macalister, *Jour. of the Anthrop. Inst.*, 1887.
14. DIVIDED PARIETAL BONE.—E. Barclay-Smith, M.D., *Jour. of Anat. and Phys.*, vol. xxxiii.—*Proc. Anat. Soc.*, p. xxiv.
15. MALAR BONE EXHIBITING INTRA-JUGAL ARCH.—E. Barclay-Smith, M.D., *Jour. of Anat. and Phys.*, vol. xxxii.—*Proc. Anat. Soc.*, p. xl.
16. PLAGIOCEPHALIC EGYPTIAN SKULL.—E. Barclay-Smith, M.D., *Jour. of Anat. and Phys.*, vol. xxxii.—*Proc. Anat. Soc.*, p. xxvi.
17. ABNORMAL CERVICAL VERTEBRÆ.—A. S. Grünbaum, M.D., *Jour. of Anat. and Phys.*, vol. xxv.
18. PARAMASTOID PROCESSES.—A. S. Grünbaum, M.D., *Jour. of Anat. and Phys.*, vol. xxv.
19. SEPARATION OF OS STYLOIDEUM.—E. Barclay-Smith, M.D., *Jour. of Anat. and Phys.*, vol. xxvii.—*Proc. Anat. Soc.*, p. xxxvii.
20. Macalister: Variations in the Atlas Vertebra. *Jour. of Anat. and Phys.*, vol. xxvii.; also p. xxxviii. *Proc. Anat. Soc.*, *ibidem*.
21. Macalister: Anomaly of the Basi-occipital bone. *Brit. Ass. Report*, Dover meeting, 1899, p. 876.
22. Kempson: Skulls from Addenbrooke's Hospital. *Proc. Camb. Anat. Soc.*, *ib.*
23. Laidlaw: Variations in the Os Calcis. *Jour. of Anat. and Phys.*, vol. xxxviii.

Among the additions made to the collection in the course of the last few months, the following are of special importance: the skulls of natives of Northern Nigeria (presented by Lieut. R. V. Elphinstone), the Perkins Collection of crania from the Sandwich Islands, and the Hayward Collection of New Zealand skulls. Dr Hose (of Jesus College) has presented an unrivalled collection of crania from Borneo. Other noteworthy specimens are the crania from Crete, the Veddah crania, and the skeleton of a Semang collected by the Skeat Expedition to the Malay Peninsula.



PLAN OF MUSEUM OF HUMAN ANATOMY, CONTAINING THE ANTHROPOLOGICAL COLLECTION.

MORPHOLOGICAL SECTION.

THE following collection of articles comprises those which are descriptive of several points of interest in human and simian morphology, regarded from the standpoint of anthropology. The specimens to which the descriptions refer are for the most part in the Anatomical Museum, but one or two are to be found in the Museum of Comparative Anatomy, and to such, definite references are given in the text.

DESCRIPTION OF A FŒTUS OF *GORILLA SAVAGEI.*

The specimen under consideration (fig. 1) appears to be the smallest representative of its species hitherto described. It was presented (with the skeleton of an adult female gorilla) to the Museum of Comparative Anatomy in the University by Capt. Hopkins (H.M. Consul at Loanda) in the year 1876. It is, unfortunately, not quite uninjured, for the outer aspect of the left upper limb is lacerated, and the right foot is imperfect, and only attached to the leg by a few tendons and ligamentous bands. The preservative is alcohol. The sex of the specimen is only just recognisable from the conformation of the external genitalia, which indicate a male. The principal dimensions of the trunk, head, and limbs are recorded in the subjoined table. One may mention here that the length from vertex to coccyx is 71 mm. From the descriptive point of view, the following notes have been made out:—

Fig. 1.—Profile view of fœtal gorilla.

The head is relatively large, globular, and a nuchal depression is conspicuous by its absence. The eyes are large and protruding, but the eyelids are closed. The nose has no bridge, and so resembles the adult organ, but its lower part seems to project rather more than in older specimens. The ears are somewhat distorted and injured from pressure; an indication of inrolling of the helix appears on the right side; some of the tubercles still stand out imperfectly fused (especially the antitragus). A puncture in front of the left auricle suggests imperfect closure of a branchial cleft. The mouth is characteristically large, the upper lip being 'shallow,' and so differing from that of chimpanzees.

In colour, the skin is uniformly whitish or grayish, no indication of the black pigmentation of older specimens being as yet apparent. The whole body is hairless, no 'lanugo' being perceptible. The upper limbs are slender, the hands being wide and long, with stout fingers and a short pollex [see figs. 2 and 3 (C and D)]. The lower limbs are proportionately short, the joints are strongly flexed, and the foot distinctly pithecoid, *i.e.*, with short, outstanding hallux, and prominent hallucal musculature. Cutaneous 'grooves' are seen both on plantar and on palmar surfaces; and it is noteworthy, in view of the observations of Hepburn[1] on this point, that transverse grooves are quite inconsiderable in comparison with those of the longitudinal and oblique groups (see fig. 3, C and D).

The spinal column is bent into a convexity directed uniformly backwards; at the lower end of the column the coccyx is visible through the skin, appearing as several bluish and shining cartilaginous plates, about 3 mm. posterior to the anus.

The abdomen is full and rounded; the umbilicus situate near the pubes. The external genitalia are represented by an almost sessile penis, a trace of the glans being just distinguishable; the organ is still grooved along its lower surface. Testes are impalpable.

The above description has been supplemented by a comparison of this fœtus with two human specimens in the Anatomical Museum, which nearly approach the gorilla specimen in size. Their weights, though recorded, were discarded as a basis of comparison. The two human specimens were characterised as follows:—The first is represented in fig. 2, A and B, of this paper, and is the same as (3) *of the Table* (*q.v.*), viz., a human fœtus of 107·5 mm. extreme height, and 76 mm. from vertex to coccyx. It is stated to be of the age of 4½ months. The other human fœtus, No. 29 of the Lee Collection in the Anatomical Museum, measures much less (66 mm.) from vertex to

[1] Published in the *Journal of Anatomy and Physiology*, 1882.

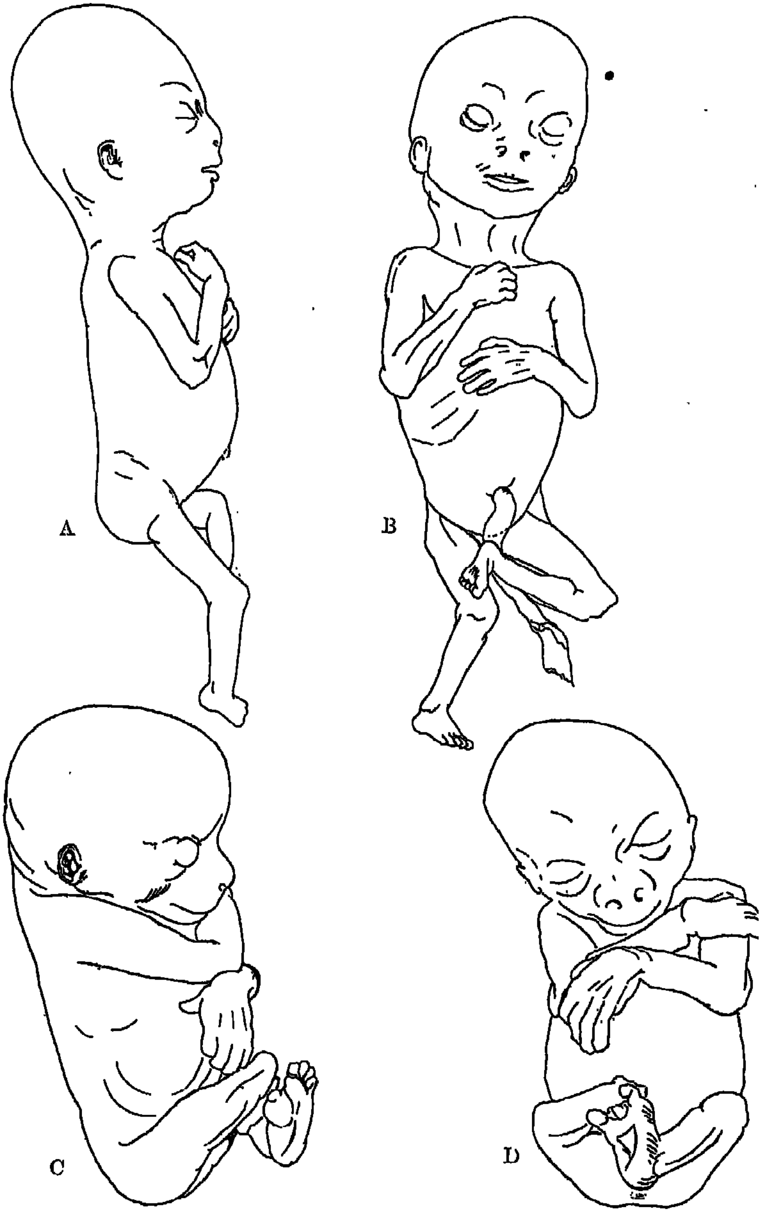


Fig. 2.
A and B, outline drawings of a human fœtus (said to be $4\frac{1}{2}$ months old), from photographs, and of the actual size of the specimen.
C and D, similar drawings (of actual size) of fœtus of gorilla.

coccyx, and was chiefly used in order to show that even at its age, which is stated to be 4 months, the human characteristics of hand and foot are clearly marked in the fœtus. The hand and foot of this specimen are therefore figured (fig. 3). A comparison of the external forms of these human fœtuses with that of the gorilla fœtus leads to the following remarks:—

The size of the head in gorilla appears, proportionately to the total bulk, greater than in man, in whom there is a marked nuchal depression, which, as remarked above, is not visible in gorilla.

The ears in all these specimens appear to have attained about the same stage of development. A furrow, limiting the helix on its proximal side, is rather more distinct in the human fœtus, and gives a more marked indication of inrolling of the pinna.

The eyes are large and bulging in both cases, gorilla and man alike.

The facial components of the head in man are distinctly smaller, absolutely and proportionately, than in the gorilla fœtus; the jaws in man are less prominent (less prognathous), the nostrils smaller and proportionately rather farther apart, the rictus oris is distinctly smaller than in gorilla: some of these facts are indicated by the respective dimensions of the parts. (See Table of Measurements, p. 18.)

The neck in man is, even at this stage, more slender, and therefore more distinct than in gorilla.

The trunk in the gorilla is stouter than in man; the iliac bones seem to have already acquired the features which are so characteristic of these bones in adult examples. The navel is situated low down on the abdominal wall in both cases.

The upper extremities in man are more slender, absolutely and proportionately, and the forearm and manus contribute much less to the length of the limb than they do in gorilla; the pollex in man already reaches to the distal end of the first phalanx of the index digit; in gorilla the pollex is far shorter, barely surpassing the distal end of the metacarpal bone of the second digit.

The lower extremities in man are more slender, and there is greater apparent inward torsion of the thigh. The whole limb is relatively longer in man, the ankle more slim, the plantar surface of the foot less inverted than in gorilla. The human foot has already (see fig. 3, A and B) attained to its characteristic conformation, and even in this younger and smaller human fœtus a few grooves are visible. These may, however, be merely due to contraction, owing to the effect of the preservative. Grooves are distinct on the plantar surface in gorilla; the appearance of the pes in the latter has already been described.

Turning now from the comparisons based on the material at

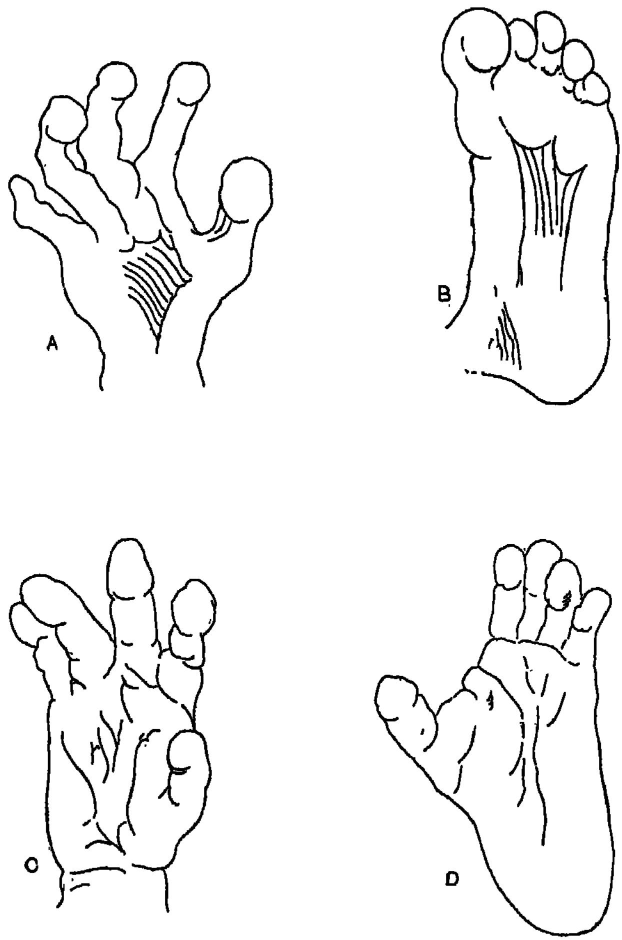


Fig. 3.

A and B, outline drawings from photographs of palmar and plantar surfaces of the extremities of a human fœtus (No. 29 of the Lee Collection), said to be 4 months old.

C and D, corresponding palmar (C) and plantar (D) surfaces of the extremities of the fœtal gorilla which is here described.

All these are enlarged from photographs of the original parts. Thus C, with an original length of 13 mm., has been enlarged $3\frac{1}{2}$ times, and D (original length 15 mm.) has been enlarged $3\frac{2}{3}$ times. A and B were originally of smaller size than C and D respectively, but have been enlarged to similar dimensions for the sake of comparison.

Cambridge exclusively, one must, in the first place, refer to Deniker's monograph on the fœtal gorilla[1]. This is the only description of a fœtal gorilla that I have been able to refer to; the specimen dealt with therein was much larger than the subject of this communication, being about 196 mm. in total length, *i.e.*, more than twice the length of the Cambridge specimen. In the accompanying Table of Measurements, I have recorded the dimensions of the Cambridge specimen side by side with those published by Deniker of his gorilla, and I have added similar measurements of a human fœtus reputed to be at the eighteenth week (4½ months).

A brief survey of the table will show the close approximation in actual dimensions of head and trunk of the (Cambridge) gorilla fœtus and human fœtus, Deniker's specimen being much larger than either. A word of warning must be given here as to the difficulty of accurate measurements of the dimensions of such fœtal specimens.

In the latter part of the table certain proportions are given. It is interesting to notice in the Cambridge specimen (*a*) the smaller contribution to the total height made by the limbs; this one would expect in an earlier stage than Deniker's specimen: (*b*) in the Cambridge specimen, the upper extremity is of much greater length in comparison with the lower than is the case with Deniker's specimen; this, again, is what one would expect in the younger animal.

As regards arm and forearm, the proportions are sub-equal in both the Cambridge and Deniker's specimens (dolicho-kerkic); but as regards thigh and leg, the figures (thigh = 100; leg in Deniker's specimen = 67·3; in Cambridge specimen = 76·4) show that the leg is very long in the earlier stage, and that subsequent growth, as far as the stage of Deniker's specimen, is chiefly 'thigh-growth,' after which, again, 'leg-growth' predominates, as is shown by the index being greater than 83 in adult gorilla (see Turner, *Challenger Reports*, "Bones of the Skeleton").

Lastly, as regards thigh and arm, the greater length of arm in comparison with thigh found in the Cambridge specimen is probably a reiteration of the indication given by excess of upper limb over lower limb taken in totality, and depends on the lesser age of the specimen; it is also influenced by the comparatively dolicho-knemic character just referred to of the Cambridge specimen (n.b. *comparatively* dolicho-knemic, for its index, 76·4, does not place it in Turner's dolicho-knemic class, for which, in fact, the index must be greater than 83).

Turning now to comparisons between the gorilla fœtus and human fœtus of approximately identical bulk and length. The stature being

[1] Published in *Archives de Zoologie Expérimentale et Générale*, 2e série, tome iii. bis supplémentaire, 1885.

taken as = 100, the human fœtus shows a human character in that the trunk forms a much smaller portion of this total than it does in gorilla, and the lower limbs accordingly form a greater proportion than in gorilla: this last fact is not, however, brought out by the figures for the lower limbs, owing to the difficulty in making certain of *points de repère.* Inasmuch, however, as the first set of dimensions, viz., total length, and length from vertex to coccyx, are more easily ascertained than limb-length, greater importance should be attached to indications afforded by the former. Secondly, the proportionate shortness of the upper extremity has already appeared in man (32 p.c. pro 45 p.c. of stature), and herein the elder gorilla fœtus (Deniker's) with 50 p.c. has still further departed from the human figure than has the younger specimen. It would be more just, however, to compare Deniker's figures with those relating to a human fœtus of age corresponding to that of Deniker's specimen. The shortness of the human forearm and manus in comparison with upper arm is already distinct, as is manifested by the figures (*q.v.*), and so is the excess of lower limb over upper limb. On the other hand, in comparison of thigh with arm, the human fœtus is intermediate between the gorilla fœtus and adult man.

To sum up, the general trend of evidence is to indicate that, in considering the ontogeny of man in comparison with that of gorilla (and probably of other anthropoid apes), the distinctive characters are quite plainly manifested at even early stages in fœtal life; and this is an indication of the importance to be attached to such differences as are thus early shown.

From this consideration one is confirmed in the belief that in their phylogenetic history, the stock of the anthropoid apes, as we know them at the present time, diverged from the precursors of man at a correspondingly early stage. As such a consideration is not without importance in influencing one's views on transitional types between man and apes, this discussion of the facts presented by the recorded figures has been appended to the actual description of the fœtal gorilla which forms the subject of this communication.

Comparative Table of Measurements.

Column 1. Deniker's data. Specimen. Sex ♀.
" 2. Gorilla fœtus in Cambridge Zoological Museum. Sex ♂.
" 3. Human fœtus in Cambridge Anatomical School. Sex ♂.

DIMENSION.	1.	2.	3.	
Vertex to plantar surface,	196	?88	107·5	
Vertex to coccyx,	135	71	?76	
7th cerv. vert. to coccyx,	91	?45	?45	
Head—Max. antero-posterior diam.,	58	?29	26·5	
Max. transverse diam.,	48	?24	23·5	
Vertex to chin,	60	32	31	
Bizygomatic diam.,	49	?22	18·5	
Interocular, internal,	12	6	6	
" external,	34	18	17	
Nose—Height,	20	8	5·5	
Width,	19	7·5	5	
Ear—Height,	16	6	5	
Width,	10	3·5	3	
Width of rictus oris,	26	10(14	5·5	
Horizontal circ. of head,	173	88	83	
Trunk—Deltoid width,	72	27·5	25·5	
Width between axillæ,	61	18	18	
" mammillæ,	32	11	12	
Horizontal circ. of thorax,	166	?73	65	
Presternal notch to pubis,	54	33	35	
Umbilicus to pubis,	24	6	7	
Iliac (intercostal) breadth,	47	?20	19	
Upper extremity—Arm,	53	21 R	19	
Forearm,	47	19 R	15·5	
Manus to tip of medius,	38	13 R	11	
Palm,	19·5	7 R	5·5	
Pollex,	11	2·5 R	4	
Index,	16·5	3·5	4·5	
Medius,	17·5	4·5	5	
Annularis,	15	4·5	4·5	
Total length, upper limb,	138	53	45·5	
Lower extremity—Thigh,	49	17	19	
Leg,	33	13	16	
Pes, length,	44	15	10	
" breadth,	13	7	4	
Hallux,	11·5	2·5	2	
2nd digit,	8·5	2·5	?2·5	
3rd digit,	10	...	...	
Trochanter to heel,	...	34	34	
(Hallux)—Base of digit 1—digit 2,	9	2·5	...	
Total length of lower extremity, less pes,	82	30	35	
Stature = 100—Vertex to coccyx,	69	80·7	70·7	
Biacromial breadth,	23	31·2	23·7	
Upper extremity,	70	60·2	42·2	
" less manus,	51	45·4	32·1	
Arm,	27	23·8	17·7	
Forearm,	24	21·6	14·4	
Manus,	19	14·8	10·2	
Lower extremity, less pes,	42	34·9	?32·5	
Trochanter to calx,	53	?38·7	31·6	
Pes,	23	17	9·3	
Cephalic height,	30·5	?36·3	28·8	
Trunk = 100—Upper extremity,	101·9	74·6	45·4	
Lower extremity, less pes,	43·3	42·2	46	
Trochanter to heel,	...	?47·8	44·7	
Arm = 100—Forearm,	88·8	90·4	81·6	
Manus,	71·5	61·9	57·9	
Upper limb = 100—Lower limb,	?42·4	?75	98·8	
Lower limb = 100—Upper limb,	121·9	133·3	98·6	Adult gorilla, 118. Adult European, 69·5.
Thigh = 100—Arm,	108·1	123·5	100	Adult gorilla, 119. Adult European, 72·5.
Thigh = 100—Leg,	67·3	76·4	84·2	Adult gorilla, 83+. Adult European, 83+.
Weight,	...	31	26	

A DESCRIPTION OF SOME DENTAL RUDIMENTS IN HUMAN CRANIA IN THE MUSEUM OF ANATOMY.

With assistance from D. H. FRASER, Esq., M.A., Caius College.

IT is desired to draw attention to the occurrence in human crania of small discrete dental masses which appear with great, though not with absolute, constancy, on that portion of the alveolar margin of the upper maxilla which lies between the last premolar and the first molar teeth. These occurrences appear to us to raise some questions of interest which may be stated in the following order:

(i) the nature of these rudiments; which may conceivably be

(*a*) remnants of teeth of the milk or temporary dentition which have not been completely displaced and ejected by their permanent successors, or

(*b*) aborted or vestigial premolars which would correspond to the 3rd premolars of the platyrrhine apes, or

(*c*) elements bearing no homological relation to those of either of the two normal sets (temporary and permanent) of the primate dentition;

(ii) the frequency with which these rudiments appear: herein considering the possible influences of

(*a*) Race,

(*b*) Age,

(*c*) Sex;

and (iii) the bearing on the preceding questions, of observations made on other primates and mammals than man, but especially on the anthropoid apes.

The general position of these rudiments has already been indicated, and the results of our observations on this point are embodied in a Table

of classification. It is necessary to note that this is not a common situation for the occurrence of ordinary supernumerary teeth, by which we mean teeth that resemble in size those immediately adjacent to them : such teeth are of most frequent occurrence in the neighbourhood of the incisors (see fig. 1 : mandible of an aboriginal Australian with a supernumerary incisor) and of the molars (see fig. 2, for the occurrence of a 4th molar tooth in the mandible of an Orang-utan). Secondly, these rudiments are of small size (cf. figs. 3 and 4) and in no way com-

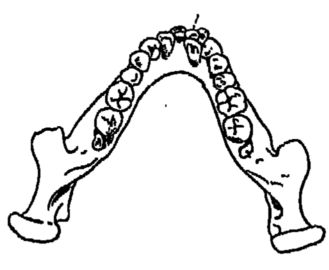


Fig. 1.

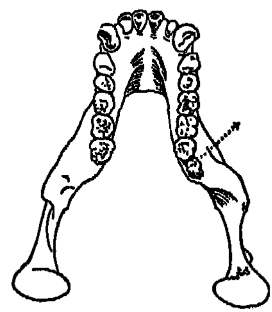


Fig. 2.

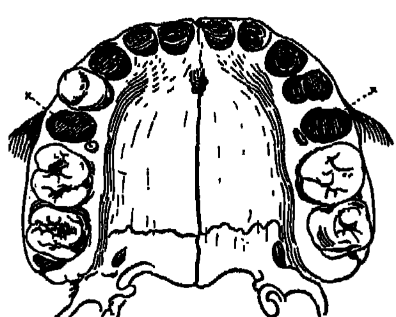


Fig. 3.

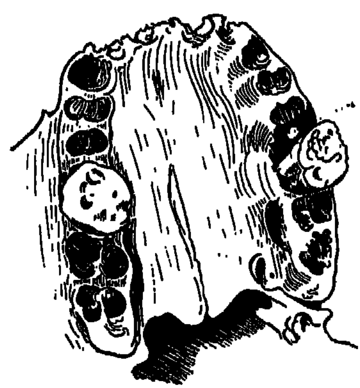


Fig. 4.

parable in this respect to the additional premolars which are described (see Tomes : *Dental Surgery*) as occasionally appearing in front of the first molar teeth. Our observations further led us to notice that small fossæ or pits are not infrequent in the same position as the rudiments where these are absent : such fossæ presumably at one time contained small dental masses similar to those we describe and they accordingly have been incorporated in the record of the Table of classification.

It is also interesting to note that the rudimentary masses occur (rarely however) in the upper maxilla between the first and second premolars, and in either case they may occupy positions on the inner or the outer border of the alveolar margin, or both, or positions of an intermediate nature. More rarely, we find indications of similar rudiments in the mandible. The fossæ or pits have a similar distribution.

Turning now to the consideration of the first important question, viz. the nature of these rudiments, we recognise that their commonest situation (between the 2nd premolar and 1st molar teeth) does not by any means preclude the possibility of their being persistent remains of the "temporary" teeth, and while we cannot consider the question as finally answered, the following considerations seem to us to discountenance the view which regards these as fragments of "temporary" teeth: viz.

(*a*) the comparative constancy of their position on the alveolar margin;

(*b*) and the rarity of their occurrence in the mandible;

(*c*) the differences which are exhibited by various races of Man in presenting these appearances; this will be more fitly dealt with later;

(*d*) the comparatively great frequence of their occurrence symmetrically on both sides of the palate;

(*e*) the fact that the recognisable persistent milk teeth are usually of considerably greater size than these rudiments; the rudiments are admittedly in one case (2154, Australian) of fair size;

(*f*) the variation in the frequency of occurrence which will be seen to characterise the different species of anthropoid apes.

On the other hand there is a slight indication of greater frequency in young adults than in senile individuals, but on the whole there is sufficient evidence to justify the view that at least some of these rudiments are not vestigial temporary teeth.

In considering the other possibilities regarding their nature, we have had the advantage of a discussion with Dr Marett Tims, to whom the specimens were submitted, and who suggests that these are examples of dental rudiments considered to belong to a third or post-permanent dentition, such as are very constantly demonstrably embedded in the alveolar arcade of certain mammals (carnivora), though they do not as a rule make their way to the surface. These are developed, however, on the lingual side of the alveolar ridge, whereas the masses are observed by us to occupy positions on the lingual or the buccal alveolar margin, or even both simultaneously, so that while a certain number of these rudiments probably fall into the category proposed by Dr Tims, on the

whole we think that it is most reasonable to adopt the view that they are aborted third premolars which constitute a human type of dentition similar to that of the New World Apes. Should further investigation prove this to be a correct view, it would constitute a link connecting man more closely with these platyrrhine primates.

We do not deal at present with the occurrence of enamel on these rudiments though this is a point which should be worked out in detail; but just now there seems to be no direct inference to be drawn from this subject in respect of the exact nature of the rudiments.

In looking at the second question, the factors influencing the frequency of occurrence, it at once appears that while Sex has no appreciable effect and Age but little, that of Race is most unmistakable. To begin with, we found *no* instances in three hundred crania of Egyptians and only one in about fifty crania of Europeans examined: whereas in the negro races and aborigines of Australia the frequency is, comparatively speaking, very great. Of all these, however, the natives of New Britain seem to present by far the greatest number, both absolutely and relatively, of cases of the abnormality. The aborigines of New Britain are followed by those of Australia and these by African negroes: the American races also appear; but whereas the number of Peruvians examined was considerably over 100, only two presented signs of these rudiments. These facts claim attention for this subject, whatever be the exact nature ascribed to the abnormalities.

Finally, on examining a large series of crania of Anthropoid Apes, the answer to the third question indicated is, that here also occurs a curious variation in the mode of occurrence: for none of the lower primates (about twelve were examined) afforded a case; no occurrence was seen in six crania of Hylobates, and four of Chimpanzees: among the Orang-utans available was one very important specimen which alone (out of nine skulls) showed the occurrence, whereas no less than seven out of thirteen Gorilla skulls presented examples of various modifications of the anomaly.

The Orang-utan skull deserves a word of special mention: the rudiments occurred in the mandible, not only between the 2nd premolar and 1st molar, but also between the 1st and 2nd molars on the left side: now in the latter case there could be no question of the retention of a temporary tooth or a fragment of the same, for the temporary series does not extend backwards beyond the position of the second premolar. This we regard as evidence of the independent origin of the fragment but we recognise that it is difficult to argue from the case of an Orang-utan to that of Man.

The extraordinary frequency of the occurrence of these anomalies in

Gorilla skulls certainly points in the same direction as the evidence from the Orang mandible. We would therefore conclude by expressing the belief that though a classification of these rudiments may be needed, yet some of them really represent aborted teeth which, if fully developed, would confer on Man a dentition formula identical with that of the platyrrhine apes.

In expressing this belief we admit that we are aware that there is a strong tendency in certain quarters[1] to insist on a greater approximation of the platyrrhine apes and Man than has hitherto been regarded as justifiable, but we have tried to discuss in an impartial manner the significance of the observations we have made.

The third and fourth figures show palates of crania of New Britain (Melanesian) aborigines of the Willey Collection which has already afforded such excellent material for research. These maxillæ bear rudiments, viz. in fig. 3, symmetrical masses on right and left sides and on the lingual margin of the alveolar border, in fig. 4, a single intermediate mass on the left side only.

CLASSIFICATION.

The Numbers are those of the Catalogue of the Cambridge Museum.

Class A. One rudiment between 2nd premolar and 1st molar, on one or both sides of Upper Jaw:

Kaffir—1774 (one side).
New Britain—3373 (see illustration, fig. 4), (one side).
New Britain—3355 (one side).
New Britain—3338 (both sides).
New Britain—3354 (one side), also Class C.

Anthropoids:

Gorilla, No. 3 (both sides).
Gorilla, No. 5 (both sides), but see Class B.
Gorilla, No. 7 (both sides).
Gorilla, No. 8 (one side).

Class B. Two rudiments, between 2nd premolar and 1st molar, on one or both sides of Upper Jaw:

Aboriginal Australian—2134 (two on each side of upper maxilla, additional incisor in lower jaw).
Aboriginal Australian—2154 (one side).
Manitoba—1837 (one side).

[1] Recent work by Dubois is particularly to be consulted.

Anthropoids:

Gorilla, No. 5 (one side).
Gorilla, No. 10.

Class C. Small pits or Fossæ between 2nd premolar and 1st molar, on one or both sides of Upper Jaw:

New Britain—3334 (one side).
New Britain—3325 (both sides).
New Britain—3328 (one side).
New Britain—3354 (one side), cf. also Class A.
New Britain—3379 (one side).
Negro—1728 (one side).
Negro—1776 (one side).
Kaffir—1774 (one side).
Aboriginal Australian—2113 (one side).
Aboriginal Australian—2159 (one side).
Aboriginal Australian—2124 (both sides).
Aboriginal Australian—2162 (both sides).
Peruvian—1932 (both sides).
Peruvian—1929 (one side).
N. American Indian—1839 (one side).

Anthropoids:

None observed.

Class D. Fossæ or Dental masses elsewhere than between 2nd premolar and 1st molar:

New Britain—3362 (one side), pit between two premolars.
Peruvian—1987 (one side), pit between two premolars.
Italian (Paestum)—1114, Dental masses (one side between canine and 1st premolar, the other between the two premolars).

Anthropoids:

Gorilla at Hamburg, second canine (not a milk tooth) (cf. Selenka, *Menschenaffen*, Part 2, Wiesbaden, 1899).
Chimpanzee: Lübeck Museum, No. 222.
Orang: Munich, No. 129[1].

[1] Reference may be made to an interesting record of supernumerary teeth in Anthropoid Apes provided by Selenka, *Menschenaffen*, Part 1, Wiesbaden, 1898.

Class E. Fossæ or Rudiments in the Mandible:

New Britain—3344 (pit between two premolars, dental rudiment between two premolars), one side.

Anthropoids:

Gorilla, No. 6, dental rudiment opposite 2nd molar, one side.

Orang—D 1, two masses on left side, one between 2nd premolar and 1st molar, the other between 1st and 2nd molars.

Gorilla—Zool. Museum (2 small rudiments).

ON IRREGULARITIES IN THE CONFORMATION OF THE POST-ORBITAL WALL IN SKULLS OF *HYLOBATES MULLERI*, AND OF AN ABORIGINAL NATIVE OF AUSTRALIA.

THE first example (fig. 1) is the skull of a specimen of *Hylobates mulleri*, presented to the Cambridge Anatomical Museum by C. Hose, Sc.D., of Jesus College. In the outer wall of each orbit is a nearly circular aperture, most easily observed when the skull is viewed from behind.

Fig. 1.—Skull of *Hylobates mulleri* (from the Anatomical Museum, Cambridge), showing a perforation in the post-orbital wall.

The nature of such an imperfection in the orbital wall is of interest, in view of the well known generalisation that the completion of the partition between the orbit and the zygomatic fossa is characteristic of the highest forms of Mammalia, and particularly of Primates.

In the genus Hylobates, the post-orbital wall is well developed normally, but the present example does not, in my opinion, exemplify a condition of retrogression or reversion on account of the imperfection alluded to; and this because the perforation is quite independent of the spheno-maxillary fissure, which is the last remnant of the communication between the orbit and the zygomatic fossa to be encroached upon by the more complete forms of septum; so that cases of reversion ought to present us with an abnormally wide spheno-maxillary fissure.

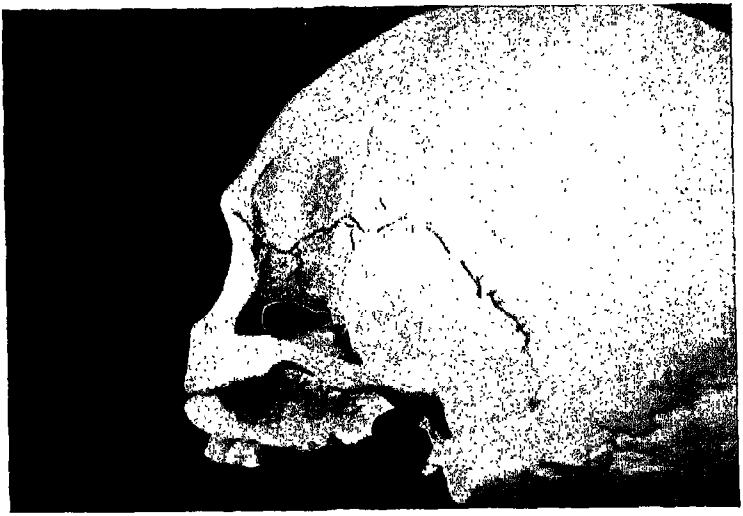


Fig. 2.—Skull of aboriginal Australian (No. 2163 in the Anatomical Museum, Cambridge), showing an unusually wide spheno-maxillary fissure.

The perforations must therefore be regarded as due to defective ossification, similar to that which not uncommonly occurs in the infra-spinous fossa of the scapula; no particular morphological significance can thus be attached to the condition.

The second example (fig. 2), which is the skull of an Australian aboriginal, does seem to bear evidence of an inferior type of conformation. As will be observed in the photograph, the spheno-maxillary fissure is of unusual width, the post-orbital wall being deficient in extent, though otherwise normally formed. There is thus an important difference between this condition and that exhibited by the skull of the gibbon first described, the deficiency in development of the post-orbital wall

denoting an inferiority in the human skull. Another skull of an aboriginal Australian (No. 2126) in the same collection presents an almost identical condition.

Two remarks in conclusion seem to be appropriate. In the first place, when the members of the sub-order Lemuroidea (of the order Primates) are compared with those of the sub-order Anthropoidea, in respect of the outer portion of the orbit, it will be observed that the transition from the mere post-orbital bar of the Lemuroidea to the post-orbital wall of the Anthropoidea is a sudden one, and that in the lowest of the last-mentioned forms (Anthropoidea) the post-orbital wall is fully as well developed as in the Simiidæ. If, then, the Australian skull presents a condition of reversion, it is not a reversion to a lower stage among the Anthropoidea, but to a still more lowly form.

Secondly and lastly, when we compare normal examples of the highest Primates, such as the Simiidæ, with the Hominidæ, we find that, as a rule, the spheno-maxillary fissure is still more nearly closed in the Simiidæ than in the Hominidæ, from which it seems justifiable to infer that *in this, as in several other respects*, the Simiidæ have reached a further stage of development and specialisation than that attained by the Hominidæ. This consideration should certainly not be neglected in any summary of the evidence for the relative positions of members of the two families in question.

ON AN UNUSUAL FORM OF NASAL BONE IN A HUMAN SKULL.

THE skull here represented (fig. 1) is that of an ancient Egyptian, which was presented to the Anatomical Museum at Cambridge by Professor Petrie. The point to which attention is called is the condition of

Fig. 1.—Skull of ancient Egyptian, showing the unusually long nasal bone on the left side. Notice particularly the line of foramina, which seem to denote the original suture between the nasal bone proper and the uppermost part of the premaxilla.

the left nasal bone, which, as may be seen in the figure, is prolonged downwards to an unusual extent along the margin of the nasal aperture. The condition on the right side is obscure, owing to the destruction of bone in this region; the fragile nature of the specimen rendering it very liable to such injury.

Two explanations of the conformation of the left nasal bone appear to be possible. Thus it may be that ossification, commencing in the

nasal bone, has spread to an unusual extent downwards into the superior lateral cartilage; the case would thus be regarded as one of an unusually large nasal bone.

Another explanation has been suggested by Professor Macalister. If the skull of a young gorilla be examined, it will be seen (as in fig. 2)

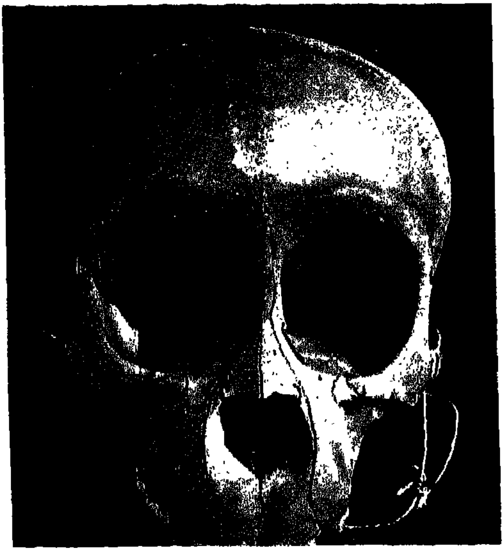


Fig. 2.—Skull of young gorilla (Camb. Anat. Mus.), showing the premaxillary bones extending upwards on the face till they meet the nasal bones.

that the premaxillary bones run upwards on the facial surface, skirting the lateral margin of the apertura pyriformis nasi, and meeting, at their highest parts, the nasal bones. The sutural lines are curiously persistent even in adult specimens of the gorilla, much more so than in the orang-utan, but a young example best shows the relations of the various bones.

It is suggested that such a relation of the premaxilla exists in the Egyptian skull under consideration, in which an abnormally developed facial extension of the uppermost portion of the premaxilla has become fused with the nasal bone. It is very important to note that two or three small foramina seem to indicate the former situation of the line of junction. Without other examples, it does not seem possible to decide which of these explanations is the correct one; but the condition is rare enough in a human skull to render it worthy of being placed on record.

NOTES ON THE OSTEOLOGY OF *GORILLA SAVAGEI.*

(i) AN unusually large *innominatum of Gorilla.* The maximum length of the bone is 412; the corresponding figures for the skeletons of the large animals dissected by Duvernoy and by Owen being 350 mm. and 360 mm. respectively. The specimen now shown also possesses an unusually well developed anterior inferior iliac spine for a gorilla. The specimen is in a private collection at Cambridge.

(ii) The University Anatomical Department possesses the *crania of two young Gorillas,* in which there is independent ossification of that part of the frontal bone adjoining the pterion region. Such an independent ossification produces the appearance of a post-frontal bone, though it is difficult to determine whether the morphological value of this is different from that of the smaller Wormian bones so frequent in this region.

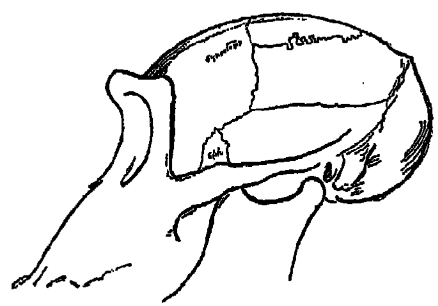


Fig. 1.—Specimen of Chimpanzee's Skull, showing divided parietal. Original in the Zoological Museum, Copenhagen.

(iii) The rare occurrence of a divided Parietal bone in a Chimpanzee is illustrated by the specimen represented in the figure. The original is in the Copenhagen Museum.

NOTE ON AN ANTHROPOID APE IN THE CAMBRIDGE ANATOMICAL MUSEUM.

THE specimen under consideration, which is an aged female, was shipped to this country from the Gaboon River, West Coast of Africa. In placing on record the results of the dissection of this anthropomorphous ape, I am met with the difficulty of being unable to refer to it with confidence as either a true Chimpanzee (*Anthropopithecus troglodytes*) or a genuine Gorilla (*A. gorilla*).

In a communication to the section of General Zoology at the International Congress recently held at Cambridge, I was able only to mention the difficulty, and time did not allow of any discussion on the subject. I have therefore ventured to return to this in rather greater detail, and hope that I may be favoured with some advice thereupon.

I turn at once to the characters of our specimen, and, to summarise these characters in the briefest manner, would note the general size and bulk (stature nearly 1200 mm.). The loss, consequent on the inadequate method of preservation employed, of almost all the hair, shows that the colour of the skin is grey, with black patches where the epidermis is retained, the face and the dorsal aspects of digits being of the latter colour. The hip- and knee-joints are much more extensible than in most specimens of the Anthropoid Apes; the limbs and extremities are distinctly slender.

The ears are remarkably asymmetrical, the upper half of the right ear being absent. This is probably the result of a bite; a similar condition is present (on the same side) in a Chimpanzee in the Zoological Museum at Leipzig.

On its arrival the specimen was thought to be a female Gorilla, the principal reasons, so far as I can ascertain, for the opinion being the facts of its great bulk and the dark colour of the face and extremities. But from the first time I saw it, I have had misgivings about the correctness of this view, and these up to a certain point have been strengthened by further observations.

These doubts were raised by the following features presented by the specimen :—

1. The large size of the ear.—Gorillas have usually small ears.
2. The comparative lack of supra-orbital prominence.—This is marked even in female Gorillas.
3. The comparative breadth of the interorbital space; which is great when compared to that of many Gorillas.
4. Characters of the upper lip: the great distance from the base of the septum nasi to the margin of the lip; and the absence of the median furrow which is so marked in many Gorillas.
5. The slenderness and narrowness of hand and foot.
6. The relatively great development of pollex and hallux.
7. The small size of the teeth; these are much worn, the third molars the least; there are indications that, originally, four cusps were present in the upper molars. As regards the lower molars, those of the third pair show comparatively little wear, and have three large and two subsidiary cusps.

The average transverse diameter of the crowns of the molar teeth is 10·4 mm. as against 14 mm., which is the corresponding average in the skull (at Cambridge) of an undoubted female Gorilla. [Cf. Table I. *infra.*]

8. Muscular system. A plantaris muscle is present in the right lower extremity. I cannot find any record of this in a Gorilla up to the present.

TABLE I.—*Dimensions of Teeth* (in millim.).

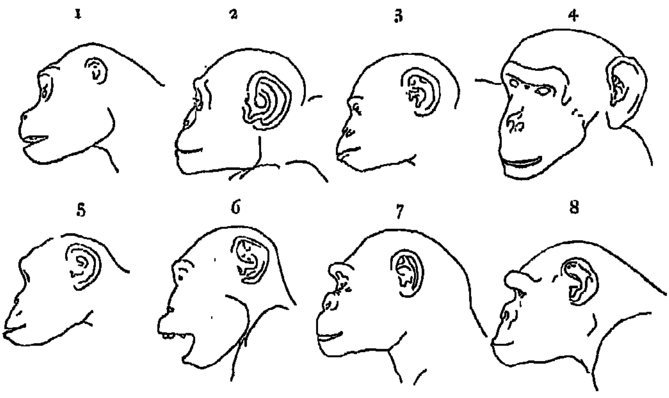
Molar	"A."		Gorilla, ♀ Skull at Cambridge	
	A.P.	T.	A.P.	T.
Upper 1 R.	9·5	10·5	12	13·5
,, 2 ,, ...		12	14	14
,, 3 ,, ...		10·5	13	14
,, 1 L.	10	10	12	14
,, 2 ,, ...		11	15	15
,, 3 ,, ...		10·5	15	14·5
Lower 1 R.		9·5	12	?
,, 2 ,, ...		11	15	14
,, 3 ,, ...		9·5	17	14·5
,, 1 L.		9·5	12·5	12·5
,, 2 ,, ...		11	15·5	14
,, 3 ,, ...		10	17	14

A.P. = Antero-posterior, T. = Transverse diameter of crown of molar tooth.

These are the principal points to which one refers in attempting to assign the creature to a recognised species; and, in my opinion, they indicate that this specimen is more correctly designated a Chimpanzee than a Gorilla. The hair is so scanty as to afford no reliable evidence on the subject.

I have been led from this case to collect some illustrations and descriptions of some of the Anthropoid Apes which have in former years presented difficulties when the determination of their species for descriptive purposes came into question.

The accompanying diagram, in which, however, the outlines are carefully traced from photographs, will serve to recall some of those



Outline tracings of the heads of various Apes.

No. 1. Head of a female Gorilla, a stuffed specimen in the Natural History Museum at Hamburg.
No. 2. Head of a Chimpanzee with ears of considerable size.
No. 3. Head of a Chimpanzee with smaller ears.
No. 4. Head of Johanna: from a photograph of the living animal.
No. 5. Head of the Ape "A," at Cambridge.
No. 6. Head of Aubry's Chimpanzee: from the illustration in the original memoir, *Nouvelles Archives du Muséum*.
No. 7. Head of an Ape described by Hartmann in the *Archiv für Anatomie*, 1876. In Hartmann's paper it appears as No. 1 in the illustrations, and is therefore referred to as Hartmann's example No. 1. The figures Nos. 2 and 3 of the present illustration are taken from the same communication by Hartmann.
No. 8. Head of Mafuka: from Mützel's drawing.

specimens. I would direct somewhat special notice to the representation of "Johanna," the large ape at Messrs Barnum and Bailey's World's Show.

In studying the creatures represented in the diagram, I paid special attention to certain facial features, and in fact, with two exceptions (Nos. 3 & 4), all the examples are drawn to scale in such a way that the facial length is constant throughout the series—a method of illustration which possesses obvious advantages in enabling comparisons to be made. The variety of profile met with in these animals is the principal point illustrated by this diagram.

I next proceeded to consider measurements of the face and ears, the data being represented in Table II. (p. 36) and being provided by records (in the cases of specimens "Au.," "Maf.," "Lüb. H," "Lüb.W," and "Den."), by spirit-specimens (viz., "B," "A," "Cy," "Cr," "H," "F," "Lag. 1, 2, 3," all at Cambridge), by "Johanna," and by a stuffed specimen at Hamburg ("Hamb.").

The features more specially observed were:—the total facial length and the part contributed to it by the upper lip; the interorbital and biorbital diameters, and the dimensions of the ears. Of these dimensions I have constructed indices (Tab. II.); and a comparison of the members of this group as arranged in the numerical order of the indices is here presented (Tab. III. p. 37).

Thus arranged, it is to be observed that the Chimpanzee-like or "intermediate" apes keep on the whole fairly closely together and away from the genuine Gorillas that I have been able to measure—the Chimpanzees furnishing the higher, and the Gorillas the lower terms of the series in the case of each index.

In these respects, too, the position of "A" is evidently rather with the Chimpanzees than with the Gorillas.

In the last table (Tab. IV.) I have presented some other dimensions (in millim.) of the Ape "A," together with the corresponding figures relating to six undoubted Gorillas at Cambridge, five of which, however, are immature. And I have added the corresponding figures for "Johanna" for the sake of comparison. Three indices show marked contrasts between "A" and undoubted Gorillas.

In comparing "A" with undoubted Gorillas, one may also specially remark the palmar breadth: this is very much less than in a Gorilla at Cambridge of rather greater size, viz. "Cy," whereas the pollex in "A" is much longer than in this Gorilla.

After ascertaining, however, that, from evidence supplied by teeth, by facial features, and by the extremities, our specimen "A," while in some respects intermediate, yet resembles the Chimpanzee rather than the Gorilla, it is not encouraging to find Hartmann in 1876, after an extended series of observations, pronouncing on none of these char-

TABLE II.—*Measurements* (in millim.).

	Specimens															
Sex	♂ "B."	♀ "A."	♀ "Au."	♀ "Joh."	♀ "Maf."	♀ "Hamb."	♀ "Lüb. H."	♀ "Lüb. W."	♂ "Cy."	♂ "H."	♂ "Cr."	♂ "F."	♀ "Den."	♂ Lag. 3	♀ Lag. 1	♀ Lag. 2
Supra-orbital ridge to lip-margin	62	118	104	(12·5)	...	...	...	...	130	72	65	12	23·5	80	91	74
Lowest part of septum nasi to lip-margin	22	42	40	(6)	...	...	...	...	30	15	13	3	8	11	18	14
Upper labial index = Index 1	35·5	35·6	38·4	(48)	? 38	...	...	...	23	20·8	20	25	34	13·7	19·8	18·9
Interlacrymal diameter	20	31	34	(5·5)	...	...	...	...	34	21	15	6	12	18	26	20
Rictus oculi	15	23	23	(3·25)	...	...	...	...	35	21	17	6	11	20	26	21
Inter-orbital index = Index 2	40	40·3	42·5	(45·8)	? 46	...	...	...	33·6	33·3	30·6	33·3	35·3	31	33·3	32·3
Ear: breadth	48	48	50	55	45	33	? 30	? 28	34	32	31	3·5	10	28	27	27
Ear: height	62	71	68	60	70	47	? 43	? 38	51	47	41	6	16	38	42	42
Superficies of Ear as represented by the product of Breadth and Height	2976	3408	3400	3300	3150	1551	? 1290	? 1064	1734	1504	1271	21	160	1064	1134	1134

"*B.*" Chimpanzee, Cambr. "*A.*" The specimen described herein, Cambr. "*Au.*" Aubry's Chimpanzee. "*Joh.*" *Johanna.* "Maf." Mafuka. "Hamb." Gorilla ♀, Hamburg. "Lüb. H." Gorilla ♀, Lübeck. "Lüb. W." Gorilla ♀, Lübeck. "Cy." Gorilla ♂, Cambr. "H." Gorilla ♂, Cambr. "Cr." Gorilla ♂, Cambr. "F." Gorilla fœtus, Cambr. "Den." Gorilla fœtus, Deniker. Lag. 1, 2, 3. Gorillas, Cambr. The last eight of these are undoubted Gorillas, "H," "Cr," and "Lag. 1, 2, 3" being immature. From "Johanna" only the ear measurements could be obtained directly, the others are taken from a photograph.

acters as really of specific import. Thus he states[1], for instance, that whereas in Chimpanzees large ears are the rule, yet individuals with small ears are not unknown, and in fact he illustrates this (see fig. 3, p. 34); whereas again in Gorillas, though small ears are usual, one sometimes finds examples in which these appendages are of large size.

TABLE III.—*Specimens in Numerical Order.*

Index 1	Index 2	Superficies auris
"Johanna."	"Johanna."	Cambr. specimen "A."
Aubry's Chimpanzee.	Aubry's Chimpanzee.	Aubry's Chimpanzee.
Cambridge specimen "A."	Cambridge specimen "A."	"Johanna."
Chimpanzee "B."	Chimpanzee "B."	"Mafuka."
Deniker's Gorilla.	Deniker's Gorilla.	Chimpanzee "B."
Cambridge Gorilla "F."	Cambr. Gorilla "Cy."	Cambr. Gorilla "Cy."
,, ,, "Cy."	,, ,, "H."	Hamburg Gorilla.
,, ,, "H."	,, ,, "Lag. 1." æq.	Cambr. Gorilla "H."
,, ,, "Cr."	,, ,, "F."	(? Lübeck Gorilla "H.")
,, ,, "Lag. 1."	,, ,, "Lag. 2."	Cambr. Gorilla "Cr."
,, ,, "Lag. 2."	,, ,, "Lag. 3."	"Lag. 1."
,, ,, "Lag. 3."	,, ,, "Cr."	"Lag. 2." æq.
		(? Lübeck Gorilla "W.")
		? "Lagos" No. 3.

Index 1. $\frac{\text{Height of upper lip} \times 100}{\text{Distance supra-orb. crest to lip-margin}}$.

Index 2. $\frac{\text{Interorbital diameter} \times 100}{\text{External biorbital diameter}}$.

TABLE IV.

	"A."	Cy.	H.	Cr.	"Joh."	Lag. 1	Lag. 2	Lag. 3
Sitting height	737	836	?	340	830	514	400	462
Palmar breadth	76	106	56	48	?	54	43	52
Pollex	60	24	22	17	?	28	21	24
Hallux	75	71	47	22	?	46	33	33
Length of pes	240	282	142	110	235	168	131	146
,, humerus......	293	360	170	128	270	220	171	200
,, radius.........	252	345	175	115	305	195	140	165
,, femur.........	260	290	?175	90	360	182	150	156 ?
,, tibia	250	270	140	94	260	168	125	136 ?
Index—Radio-humeral	85·3	95·8	102·9	89·8	?112·8	88·6	81·9	82·5
,, Tibio-femoral	96·0	93·1	? 80	104·5	72·3	92·3	83·4	87·1 ?
,, Humero-femoral	112·7	124·1	? 97·1	142·3	75	120·9	114	128
,, Intermembral	107	125·9	?109·2	132·1	92·7	118·5	113·1	124·6

[1] *Zeitschrift für Ethnologie*, 1876.

But yet on finding the coincidence of so many characteristics of Chimpanzee as in this animal, one may well be excused hesitation in continuing to regard the specimen as a Gorilla.

However, it can hardly be described as an ordinary example of *Anthropopithecus troglodytes*; and I am inclined to think, in the absence of contradictory evidence, that we have here a specimen of Du Chaillu's Kooloo-Kamba. Its great size gives it some claim to an intermediate position between *A. troglodytes* and *A. gorilla.*

But if an intermediate form, it differs appreciably from members of another group of intermediate forms which we may call the Mafuka group, and which is constituted by Mafuka, Johanna, and Hartmann's example No. 1 (cf. fig. 7, p. 34).

Further Note on Specific Differences in the Anthropoid Apes.

1. After reading a note on this subject in December 1898, I learned that in the Zoological Museum at Jena is an Ape, the determination of whose species has given rise to some discussion: the point in dispute being, whether it should be described as a Gorilla or a Chimpanzee. Through the kindness of Professor Haeckel I have been enabled to examine the specimen and have arrived at the following conclusion—that, although labelled "Junger weiblicher Gorilla,"[1] neither the stuffed skin nor the skeleton affords any evidence to justify the term Gorilla; and the facts that hardly a suture remains unclosed in the skull, that every epiphysis has long been fused with its diaphysis in the limb-bones, and that the teeth are much worn down, indicate that this was an *aged*, and not a *young* female. The average transverse diameter of the crowns of the molar teeth is 9·7 mm. (cf. the ape "A" at Cambridge, where the average is 10·4; and an undoubted female Gorilla with 14 mm.); and the mounted skeleton measures only 1010 mm. in height (less than 3 ft. 4 in.). On renewed careful examination of the skeleton and of the skin, including observations on hair-colour, ear-dimensions, characters of the extremities and face, I could find no reason for regarding it as other than an old female Chimpanzee, but one considerably smaller than our Cambridge specimen "A" (also an aged female).

[1] The label runs:—"*Troglodytes gorilla* (Cuv.). Junger weiblicher Gorilla, von einem Urunga Neger, 1885, in der Kolonie Gaboon erlegt."

2. The foregoing instance is one in which a Chimpanzee is incorrectly described as a Gorilla. The converse, whereby a Gorilla is described as a Chimpanzee, may be noticed in the paper by Professors Kükenthal and Ziehen of Jena (in the *Jenaische Zeitschrift für Naturwissenschaft*, Band xxix. 1894), entitled: "Untersuchungen über die Grosshirnfurchen der Primaten." On mentioning *Gorilla engena*, the authors state that they themselves had no opportunity of making observations on cerebral hemispheres of this species. They draw up, however, from the works of others, a list of twenty characteristic features of the fissures of the cerebral hemispheres in this species. They proceed to *Troglodytes niger*, of which they describe six hemispheres, with which they combine descriptions of two hemispheres of *Troglodytes savagii*! The latter specimens are in the Museum of the Royal College of Surgeons, and are the cerebral hemispheres of a Gorilla that died in the Zoological Society's Gardens in 1887. More interesting than the omission of the authors to recognize the identity of *Gorilla engena* with *Troglodytes savagii* is the fact that out of the ten particulars in which the hemispheres of *T. savagii* are stated to differ from those of *T. niger*, in three only does such divergence from *T. niger* imply agreement with features previously described by the authors as characteristic of *Gorilla engena*, while in three cases there is divergence from these characteristic features of *Gorilla engena*, and in the remaining four instances no comparisons can be made. But further, from the examination of these hemispheres of *T. niger* and *savagii*, the authors proceed to draw up a list of characters specially typical of the hemisphere of the Chimpanzee, and seventeen of these affect features that appeared in the list for *Gorilla engena*. Of these seventeen characters, thirteen actually present similarities in conformation between the hemispheres of *Gorilla engena* and of the Chimpanzee (i.e. *T. niger* and *T. savagii* of Profs. Kükenthal and Ziehen), while only four indicate differences of conformation. If we may accept the data, no better proof could be adduced of the practical identity of Gorilla and Chimpanzee in respect of cerebral convolutions.

3. The study of cerebral hemispheres of Gorilla and Chimpanzee respectively (in my possession) shows in strong relief the diversity of conformation that may be met with in the brains of the former. Consequently the value to be attached to the arrangement of the cerebral convolutions as a criterion of species is insignificant, and herein the conclusion arrived at in the preceding paragraph is corroborated. I should prefer, however, to postpone the further consideration of this part of the subject until I have been able to consult the communication so lately made to the Zoological Society on the brain of the Gorilla.

Two points respecting the geographical distribution of the Gorilla

appear to me to call for notice here. Last year (1898) the occurrence of a Gorilla near Brazzaville on the Congo was recorded, and, in fact, the specimen ("Cr, Cambr.") was brought to England. Secondly, in the same year was published Captain Burrows's book, entitled *The Land of the Pigmies*, which contains a photograph of an Ape described as a Gorilla, which was shot at Stanley Falls. If we regard this Ape as a genuine Gorilla, it follows that the eastward range of that animal is much more extensive than it is commonly supposed to be; but unfortunately the evidence of the photograph alone does not support that specific title, showing as it does that the specimen was possessed of distinct Chimpanzee features. Without further investigation, therefore, no final conclusion on this point can be arrived at.

VARIATIONS IN THE CRANIA OF *GORILLA SAVAGEI.*

THE following account results from observations made on more than one hundred skulls of the gorilla. The actual number of specimens available for establishing the desired facts was 109, and these are distributed among several museums in this country and in France.

The observations are recorded in tabular form for facility of reference, and in the following paragraphs the results of an examination of these tables are presented, and in some cases commented upon.

Classified according to *sex*, 62 skulls are those of adult or aged males, 38 of adult or aged females, 13 of immature individuals.

The great size of the skulls of adult males is the most striking feature. The brain-case is relatively small but it bears great bony ridges or crests for the attachment of the temporal muscles. The facial skeleton is enormously large and massive, the brow-ridges prominent, the orbits high and angular, the nasal aperture wide with indistinct lower margins, the nasal bones resemble those of the Cercopithecidae. The palate is very long and narrow with immense canine teeth. The jaw is massive and the sigmoid notch is shallow.

With regard to observations on the prominence of the bony crests of the cranium, in about half the number of female skulls there is coalescence of the temporal ridges to form a sagittal crest of small dimensions: in some skulls of adult females an arrangement of alternate ridges and furrows is seen in the region of the sagittal suture: in five cases three such ridges with intervening furrows are noticed.

In the skulls of adult males there is in every case a sagittal ridge, varying considerably in height in different individuals: three degrees can be recognised, viz., crests of about 20, 30, and 40 to 45 mm. in height respectively. Specimens are evenly distributed among these three classes, but rather fewer occur in the last, *i.e.* where the crests exceed 40 mm. in maximum height.

The height of these sagittal crests does not depend on age, for, in

some specimens with clean and little-worn teeth, the crest is developed to an exaggerated extent, while in some evidently aged specimens the height is not nearly so great. In one case of an old male this crest is involved in a general pathological process affecting most of the cranium.

With regard to other bony prominences, large mastoid processes occur in one case only; infra-temporal crests are, as a rule, small and oblique in direction, and are in no case produced into such spurs or spiny processes as often occur in human crania. Figures represent the relative extent of development of the tuber maxillare in the two sexes, in neither of which was it at all usual to meet with such a comparatively large tuber maxillare as commonly in certain human races contributes considerably to the palate length. A large tubercle directed downwards from the malar bone is seen in three male specimens, being probably connected with the size and extensive origin of the masseter muscle. Further correlations of a similar kind are noticed where the ascending ramus of the mandible attains considerable width, as in three males, measuring respectively 80, 77, 76 mm. across, while in two other cases the angles of the mandible are much everted.

Again, the genial tubercle is not unfrequently represented by a sharp ridge in adults of either sex, though in several it is absent, or replaced by a depression. A styloid process was not observed in any of 94 specimens examined with regard to this feature: a frontal exostosis behind the supra-orbital crest and between the converging temporal crests, of a female specimen, is worth notice; while the Eustachian processes on the petrous bones (whose axes are nearly parallel) vary a good deal in shape, being perforated in three cases, bifid in two others.

The observations on the conformation of the region of the foramen magnum may thus be summarised: in one case only was there a distinct trace of a third occipital condyle, so that this feature is very rare; in one case only was there an approach to a patent post-condylar foramen: the condyles present a good deal of variety in size and position,—prominent, oval, and everted or depressed, round, and small forms occur with almost equal frequency; cases occur (*a*) where a transverse groove interrupts each condyle; (*b*) where an almost longitudinal ridge modified the articular surface; and also (*c*) in which prolongations are sent off either anteriorly or posteriorly, the form of the foramen magnum being correspondingly modified. (Where a groove interrupts the articular surface, the reason for its presence may be imperfect coalescence of the parts of the condyles formed from the ex-occipitals with those formed from the basi-occipital.)

Passing to the region of the pterygoid plates, one may notice that the external plate is usually small, and not very strongly everted; that

a fossa on the external surface of the external pterygoid plate, or a ridge (called pre-pterygoid) bounding such a fossa anteriorly, are both of rare occurrence. A pterygo-spinous foramen is of more frequent occurrence. Further cases are noticed wherein sharp spurs project outwards from the free edge of the external plate; where the hamulus of the internal plate attains considerable size; where the hamulus is represented by a quadrate mass; where the scaphoid fossa is prolonged down the internal pterygoid plate to the hamulus.

The disposition of parts in the posterior region of the hard palate is subject to a good deal of variation, the varieties being often attributable to the frequent lack of union between the palatine processes of the palate bones. They may be conveniently classified with regard to the presence or absence of a posterior palate spine. The results of observations on 105 specimens show that an indication of such a spine is met with in one only out of every three cases. The disposition of the vomer with regard to the palate bones also offers some interesting varieties: thus, in four cases it appears in the hindmost portion of the median suture of the hard palate, and is there embraced by the palatine processes of the bones of that name; in other cases (six in number) the palate bones still do not meet, but are separated by processes of the maxillæ, and not by the vomer. In the situation of the anterior nasal spine of Man, small tubercles are seen in four cases on the facial surface of the premaxillary bones. The question whether such tubercles really represent the anterior nasal spine of Man is rendered difficult by the fact that in about 36 other cases (young individuals being in a majority) a sharp spine is directed backwards from the posterior or intranarial surface of each premaxillary bone, and comes into contact in many cases with the vomer. It is suggested that such are indeed true anterior nasal spines, which, owing to the great size of the incisor teeth, and the consequent swollen condition and larger dimension of the premaxilla in the gorilla, do not assume the prominent and conspicuous position that they occupy in Man. In this connection it may be remarked that the nasal spine is a feature of the infant human skull, and that the latter in this respect differs from skulls of either young or adult gorillas quite as much as does the adult human skull. It would be interesting to observe stages between the backward and forward direction of this anterior nasal spine in gorilla and Man.

The infra-orbital margins are, as a rule, much bevelled off; in one or two cases, however, they are quite sharp in adults, though this seems a persistence of a feature of adolescence. In no case among 102 specimens examined did a hamulus lacrymalis project over the orbital margin on to the facial surface.

Of the teeth it may be remarked that the second lower bicuspids are usually quadrituberculate: six cusps are sometimes seen in true molars; one skull has acquired all the teeth of the permanent set, with the sole exception of the canines, whose places are still occupied by their feeble "milk" representatives. In another case five upper incisors are seen. In two examples an additional molar tooth is present (in both on one side, and in one jaw only), making six teeth posterior to the canine. The two upper rows of post-canine teeth present varying degrees of convergence towards one or other extremity of the palate.

With regard to the cranial sutures, it may be remarked that besides the early synostosis of the components of the occipital and malar bones, that of the two nasal bones is fairly constant in its occurrence. On the other hand are cases where sutures remain open to a later period than might be expected. In two skulls (both of females) is this the case with the coronal suture: more notably is it the case with the spheno-basilar suture, which was frequently found still unclosed in specimens otherwise evincing signs of a fully adult condition (of this there are 13 examples, mostly of male skulls): in one case an ossicle was situated in the still unclosed suture.

Of such ossicles in sutures examples are not rare, more especially in young specimens; the usual situations being the lambdoid suture, the region of the lacrymo-ethmoid suture and the Glaserian fissure. Of the region of the lacrymo-ethmoid suture, it must be said that it is more usual to find the frontal and superior maxillary interposed between the lacrymal and ethmoid bones, than to find a lacrymo-ethmoidal suture.

On one occasion only was there seen a spheno-maxillary suture cutting off the malar bone from the spheno-maxillary fossa. An infra-orbital suture on the facial surface (pars facialis) is not uncommon, and the infra-orbital canal on the orbit is less completely roofed in than in Man. A table represents the data with regard to the conformation of the pterion region: in one case (on one side, and in a young specimen) was a spheno-parietal suture met with at this point. Hartmann (*Der Gorilla*, Taf. xix. *2a*) represents a similar conformation in the skull of an adult male.

Of foramina the following notes were made:—The foramina spinosum, Vesalii, and lacerum anterius are of inconstant and rare occurrence. In one specimen intracranial appearances indicate that the middle meningeal artery passed through the foramen ovale, even though a foramen spinosum is present. Obelial foramina (10 examples) often pierced the sagittal crest, without, however, penetrating to the interior of the cranium. The olfactory foramina in the cribriform plate of the ethmoid seem to be usually disposed in two ranks. The number

of the infra-orbital foramina on each side is subject, as the table shows, to considerable variation. The arrangement of the anterior palatine foramen suggests that in the broadly expanded palate of the gorilla, the foramina of Scarpa and Stenson are not, as in Man, crowded together into one depression, but that the former two occupy the middle line, while the two latter occupy lateral positions somewhat removed from that region. The presence of a depression, sometimes so deep as to be called a foramen on the exterior of the basi-occipital bone, was of not uncommon occurrence; possibly it replaces the pharyngeal spine, though such a depression not unfrequently occurs in human crania.

The concluding remarks refer to the skeletons generally, and to certain pathological features. Of the former, the occurrence of a defective posterior arch of the atlas in an adult female, and of fourteen ribs in a young specimen (at Le Havre), are noteworthy; in the skeleton of an adult male of very great size at Liverpool, the last lumbar vertebra is ankylosed with the sacrum on one side; in an adult male skeleton at South Kensington the right olecranon fossa is perforated.

Of skeletons of 25 individuals examined, 6 (24 per cent.) were affected by some pathological process. Of these, the skeleton of a large adult male (presented by Henry Duckworth, Esq., to the Brown Museum, Liverpool) shows signs of extensive disease, osteo-arthritic in nature, in the left condyle of the jaw and glenoid fossa of that side. A skeleton in the Museum of the Société d'Anthropologie at Paris gives evidence of much widespread necrosis of the skull, especially of the left side of the face in the region of the orbital margins; the left scapula is also affected, and its squamous part perforated. The specimen presented by Franquet, at the Jardin des Plantes, shows extensive necrosis of the face in the region of the left upper canine tooth especially (and one humerus is much shortened). In a specimen at South Kensington ulceration has occurred near the base of the socket of the left lower canine tooth, leaving a fistulous passage between this and the exterior of the bone, being probably associated with dental caries. The same condition obtains in a second specimen at Kensington, in addition to extensive necrosis of the left humerus. Of other skulls affected by morbid processes, those are most common in which ulcerative disease has occurred near the roots of the canine teeth; examples are also met with of disease over the antrum on the face, on the external angular process of the frontal bone, on the hard palate, and in the nasal fossæ.

The foregoing observations may be considered in reference to the frequency and prominence in skulls of gorilla of features which, when met with in human skulls, are sometimes said to indicate a "simian" type. And indeed such conformations seem to occur with greater fre-

quency in skulls of certain of the "lower" human than in the "higher" human races. With regard to such points, a general review seems to show that of the peculiarities of skulls of "low" human races, not so many are "simian" as might be expected. But here it must be remarked that such observations ought to be extended to crania of other members of the family of anthropoid apes. Having regard to this, it is suggested that the following are decidedly *gorilla-like* features of the skull of a member of a "low" human race, viz. :—

(1) Fronto-squamous suture at pterion.
(2) Fronto-maxillary suture in orbit.
(3) Early and complete closure of foramen lacerum anterius.
(4) Absence of vesalian and post-condylar foramina.
(5) Diminutive posterior palatine spine.
(6) Diminutive styloid process.
(7) Flattened outline of squamous portion of temporal bone.

Whereas the following features, in which skulls of a "lower" human race differ from those of a "higher" race, are not points which approximate them to the crania of gorilla :—

(1) Sphenoid contribution to glenoid fossa.
(2) Large tuber maxillare.
(3) Third occipital condyle.
(4) Trace in adult of suture dividing occipital squama from ex-occipitals.
(5) Spheno-maxillary articulation outside the orbit cutting off the malar bone from the spheno-maxillary fossa.
(6) External-pterygoid fossæ, pre-pterygoid ridge.
(7) Large and spiny infra-temporal crests.

The last (6 and 7) sets of features are worthy of remark. Though in the gorilla the glenoid fossa is large and flattened, and thus adapted to movements of mastication, yet the presence of an immense "endo-glenoid" tubercle prevents lateral movements. In correlation with which is the fact of the small degree of development of the infra-temporal crests and external pterygoid plates. In further correlation with movements of the mandible is the conformation of the region of the spine of the sphenoid, in the gorilla much developed, so that the position of the foramen ovale relative to the petro-sphenoidal fissure (which is determined by it) is seen to differ from that in Man, in whom the interval between the two is relatively less than in the gorilla. Man in this respect occupies a position intermediate between the orang and gorilla; the arrangement in the former being approached by that in the young gorilla.

TABLE I.

Character	No. examined	Mode of Occurrence
Sagittal crest	78	Adult or aged males—small crests, 19; large, 22; very large, 16. Females—small crests, 18; no crests, 3.
Styloid process	94	Did not occur.
Pterygo-spinous foramen	...	Present in 6 males (a trace in another male); both sides in two cases; present in 6 females.
Hamulus lacrymalis	102	In no case projected over the orbital margin.
No. of post-canine teeth	80	Additional molar in 2 males only; 51 males, 29 females examined.
Trace of division of occipital bone	98	Occurred in 6 out of 7 young examined; no occurrence in 56 adult males or 29 adult females.
Trace of division of malar bone	104	Did not occur. Of the 104, 13 are young specimens.
Anterior nasal spine	72	Traces seen in 36 examples (15 males, 13 females, 8 young).
Sphenoid contribution to glenoid fossa	95	Did not occur.
Foramen vesalii	101	A trace seen on one side, and once only.
Foramen post condylare	84	A trace seen once only.
Foramen lacerum anterius	93	Closed in all except one young specimen.
Spheno-maxillary suture outside orbit	95	Occurred once, on left side only.

TABLE I.—*Sheet* 2.

Character	No. examined		Mode of Occurrence	No. by Sex
Infra-temporal crests	102	Males	Insignificant, 15; small, 30; prominent, 14	
		Females	Insignificant, 9; small, 15; prominent, 10	
		Young	Insignificant, 12	
Tuber maxillare	102	Males	Absent, 2; insignificant, 13; moderate, 40; large, 5	60
		Females	Absent, 17; insignificant, 9; moderate, 7; large, 0	33
		Young	Absent, 4; insignificant, 5; moderate, 0; large, 0	9
Genial tubercle	78	Males	Depression, 12; flattened surface, 6; ridge, 28	
		Females	Depression, 6; flattened surface, 3; ridge, 13	
		Young	Depression, 0; flattened surface, 2; ridge, 8	
External pterygoid plates	95	Males	Much everted, 31; moderately everted, 24	55
		Females	Much everted, 16; moderately everted, 15	31
		Young	Much everted, 7; moderately everted, 2	9
External fossa	105	Males	Insignificant, 55; noticeable, 5	
Pre-pterygoid ridge	105	Females	Insignificant, 29; noticeable, 2	
		Young	Insignificant, 10; noticeable, 1	
Posterior palatine spine	105	Males	Type A. 10. Type B. 19. Type C. 30	59
		Females	Type A. 6. Type B. 13. Type C. 16	35
		Young	Type A. 4. Type B. 2. Type C. 5	11

TABLE I.—Sheet 5.

Character	No. examined		Mode of Occurrence	Length: Lacrymo-ethmoid	Length: Fronto-maxillary	No. by Sex
Lacrymo-ethmoid suture	Open in 53	Males	9. Fronto-maxillary 17.	R. 4 (6) L. 4 (4)	8 (9) 5 (10)	
		Females	6. Fronto-maxillary 7.	R. 5·5 (4) L. 3 (4)	5 (4) 4·5 (2)	
		Young	4. Fronto-maxillary 10.	R. 2 L. 4	3 (2) 5 (5)	
Pterion region (Length of fronto-squamous suture)	77	Males	R. 18 (13) L. 19 (14)			
		Females	R. 17 (3) L. 15 (4)			
		Young	R. 15 (18) L. 16 (16) (young adults here included)			
Foramen spinosum	97	Males	Present on both sides, 24; present on one side, 17; absent, 15			56
		Females	Present on both sides, 17; present on one side, 5; absent, 9			31
		Young	Present on both sides, 7; present on one side, 1; absent, 2			10
Infra-orbital suture	106	Males	Closed, 49; open partially, 10			59
		Females	Closed, 33; open partially, 2			35
		Young	Closed, 4; open partially, 8			12
Infra-orbital canal	108	Males	Open about *half-way* throughout orbit, 28; open nearly throughout orbit, 26			
		Females	Open about *half-way* throughout orbit, 15; open nearly throughout orbit, 17			
		Young	Open about *half-way* throughout orbit, 3; open nearly throughout orbit, 9			
Infra-orbital foramina (with data from Hartmann)	111	...	One on right, 58 (78 H.); two on right, 51 (56 H.); three on right, 2			
	136	...	One on left, 61 (77 H.); two on left, 42 (51 H.); three on left, 7 (H. indicates that the specimens figured by Hartmann are included.)			

Figures in brackets indicate the number of examples whence average length is calculated.

D.

TABLE II.

The following figures relating to the frequency of occurrence of the fronto-squamous articulation at the Pterion are of much interest. The data were collected by Virchow and Ranke.

The percentage frequency of occurrence of the articulation of the frontal bone with the squamous portion of the temporal bone in the region named is as follows:

	Percentage	No. examined
Europeans	1·53	11,000
West Africans (Ecker gives 20 %)	5·66	830
Australians (Virchow gives 16·9 %)	9	422
Mallicollese	50	
Orang-utan	33·6	246
Chimpanzee	77	77
Gorilla	98·7	77

TABLE III.

The human skull when compared with those of Gorilla and Orang-utan appears to be more highly specialized in respect of

(1) The greater size of the cranial portion.
(2) The smaller size of the facial portion with associated greater flexion of the base, and alteration in position of the occipital condyles.
(3) The larger mastoid processes.
(4) The larger alisphenoid.
(5) The lacrymo-ethmoidal suture in the orbit (herein Simia agrees with Homo).
(6) The small size of the premaxilla and its early fusion with maxilla.
(7) No diastema.

The human skull is nevertheless less specialized in respect of

(1) Later synostosis of certain cranial sutures, *e.g.* the sagittal and temporo-parietal.
(2) Smaller muscular crests and ridges.
(3) Parieto-sphenoid suture at Pterion (herein Simia agrees with Homo).
(4) Wider spheno-maxillary fissure.
(5) Larger nasal bones.
(6) Shape of palate.
(7) Reduction in number of molar cusps and in form of molar teeth.

OS FRACTURÉS DES ORANG-OUTANS.

Les lésions osseuses chez les singes anthropoïdes ont été signalées il y a déjà quelque temps; je rappellerai surtout les observations de M. Rollet sur les squelettes des singes anthropomorphes des musées de Paris; aussi n'envisagerai-je pas la question à un point de vue général.

Je me contenterai de mettre sous vos yeux deux cas spéciaux, qui peuvent être regardés comme les types d'une catégorie d'exostoses jusqu'ici peu connue, c'est-à-dire d'exostoses d'origine sympathique, ou mieux, pour employer l'expression de Dupuytren, de cals vicieux. Sur les photographies des os longs des membres d'un orang, vous verrez d'abord un bel échantillon de la production excessive du cal dans les os d'un avant-bras fracturé en deux endroits distincts. Le processus réparateur ayant envahi la membrane interosseuse, a déterminé la soudure des os qui, dès lors, se sont trouvés solidement fixés dans l'attitude de la supination. Les os de la jambe du même orang montrent également un cal surabondamment développé, mais, cependant, la fusion des deux os ne s'est pas effectuée, à cause probablement du mouvement de séparation qui paraît avoir accompagné les fractures.

La pièce suivante a été trouvée dans une collection renfermant un nombre considérable d'os d'orangs, qui sont arrivés à Cambridge entassés comme on les avait ramassés dans une caverne de Bornéo. Je m'empresse de vous dire qu'il ne s'agit pas du tout d'ossements fossiles, car on savait que les orangs avaient été tués dans cet endroit quelques années auparavant. La collection renferme quatre crânes et une quantité d'os provenant d'au moins cinq orangs adultes. La pièce qui nous intéresse est un humérus droit, et ce qu'il a de remarquable, c'est l'exostose qui se trouve à l'extrémité inférieure de la diaphyse, exostose qui m'a fait penser immédiatement à celle que porte le fémur du Pithecanthropus erectus, surtout parce que dans les deux cas, c'est la seule lésion pathologique présentée par l'os. Je me suis demandé si les

deux exostoses avaient la même origine, mais il ne me fut pas possible, tout d'abord, de me faire unè conviction. Aussi fut-ce avec une grande satisfaction que je trouvai, en poursuivant mes études sur les os de Bornéo, une seconde pièce qui nous fournit l'explication de la première. Ce sont les deux os de l'avant-bras du côté droit (c'est-à-dire du même côté que l'humérus) qui sont, comme vous le voyez, fusionnés à la suite d'une fracture. Plus tard je rencontrai un os innominé fracturé du côté gauche, provenant probablement aussi du même orang. Quant aux os de l'avant-bras, vous remarquerez qu'il ne s'agit pas seulement d'une fracture, mais qu'il existe aussi une luxation. A la suite d'une fracture du cubitus à quelques centimètres au-dessous de son extrémité supérieure, il s'est produit un déplacement vertical du radius, qui a entraîné avec lui le fragment inférieur du cubitus. C'est ainsi que le radius est venu finalement s'appuyer sur la face supérieure du condyle externe de l'humérus, et voici les effets qui en sont résultés. Premièrement, à la suite de la réunion de deux fragments du cubitus, arriva la fusion des deux os de l'avant-bras. En second lieu, le frottement du radius dans sa position nouvelle et anormale a déterminé la production sympathique de l'exostose humérale, qui n'est donc pas autre chose qu'une masse de "cal vicieux." Par conséquent, les mouvements de l'articulation du bras avec l'avant-bras se sont trouvés limités dans tous les sens, et il est facile de s'en convaincre en regardant les photographies. Je n'ai pas besoin de vous rappeler l'importance du rôle joué par le membre antérieur dans la vie arboricole de l'orang. Mais ce n'est pas là le point sur lequel je veux insister. Ce que je tiens à faire remarquer c'est que si l'on avait trouvé seul, dans un gisement quelconque, l'humérus portant cette exostose, il n'aurait pas été facile de reconnaître l'origine réelle de la lésion; mais du moment que l'on possède les os correspondants de l'avant-bras, il ne reste plus de doute sur l'explication du phénomène. Je suis loin cependant de prétendre que la lésion fémorale du Pithecanthropus erectus soit le témoignage d'une fracture quelconque. Dans les discussions qui ont surgi à propos de cette lésion fémorale, plusieurs hypothèses ont été émises qui invoquent un état pathologique. M. Dubois l'attribua à un anévrisme de l'artère perforante supérieure de la cuisse. M. Virchow regarda l'exostose comme une preuve de l'existence d'un abcès d'origine vertébrale, et, par conséquent, d'une carie de la colonne. Plus tard, M. Virchow a changé son avis en regardant l'exostose comme le produit de l'ostéo-arthrite. Une autre hypothèse, celle de M. Bland Sutton, veut que la lésion soit la manifestation locale d'une affection générale des muscles, connue sous le nom de *Myositis ossificans*. Il n'est pas nécessaire de revenir sur ces discussions; je vous rappellerai seulement que M. Virchow a exposé à

Berlin des pièces intéressantes qui prêtent une grande probabilité à sa dernière façon de voir. Les observations de M. Prochownik de Hambourg sont aussi à citer à ce propos.

Il résulte de mes observations que, chez les Primates, on rencontre une cinquième catégorie de ces états pathologiques, à savoir les exostoses qui se produisent à la suite d'une fracture, par l'extension du processus réparateur bien au delà du siège primitif de la lésion. Les quelques pièces nouvelles que j'ai eues à ma disposition pourront servir à une étude plus détaillée de l'anatomie pathologique générale des Primates.

NOTE ON THE PELVIC AND ABDOMINAL ORGANS AND ANATOMY OF *GALAGO GARNETTI* (*LEMUROIDEA*).

(In collaboration with T. R. ELLIOTT, Esq., M.A.,
Trinity College, Cambridge.)

THE specimen was obtained from a dealer who was ignorant of its history. Presumably the animal came from South Africa. The body, apparently that of an adult, excited interest in the first place because to superficial examination it presented hermaphroditic characters. The external generative organs were seemingly those of a male; yet large ovaries and uterus were evident upon the opening of the abdomen for the purpose of injecting formalin. A more detailed study of the body was therefore made to decide this point.

External characters.

Length—tip of snout to root of tail	—27 cms.
tip of tail " "	—33 cms.
Total length	—60 cms.

Nails flattened: with the exception of that on the 2nd digit, of which the form was the usual projecting talon with convex edge, the distal edge of each was *concave*, and markedly so on the toes. This concavity was natural, and not resultant from fracture.

Sexual organs. Clitoris stout, 6 mm. in length: sparsely covered with hairs: prepuce present and meatus vertical. From anus to root of clitoris, 25 mm. Half-way between these points a depression devoid of hair: the outer boundaries of the depression were formed by two knobby eminences: the valley between these, about 3 mm. in diameter, was floored by thin bare skin, in which no sign of a cleft could be discerned. Later dissection showed that the vagina abutted upon the right side of this membrane. At first sight the lateral eminences resembled scrotal sacs; but upon the inner side of each was discovered a narrow pit, limited by a semilunar fold of skin, and extending outwards into their substance.

This communicated with ducts in the mass of each, receiving a quasi-sebaceous secretion from the subsidiary sex glands that were histologically demonstrated as the basis of these dermal eminences.

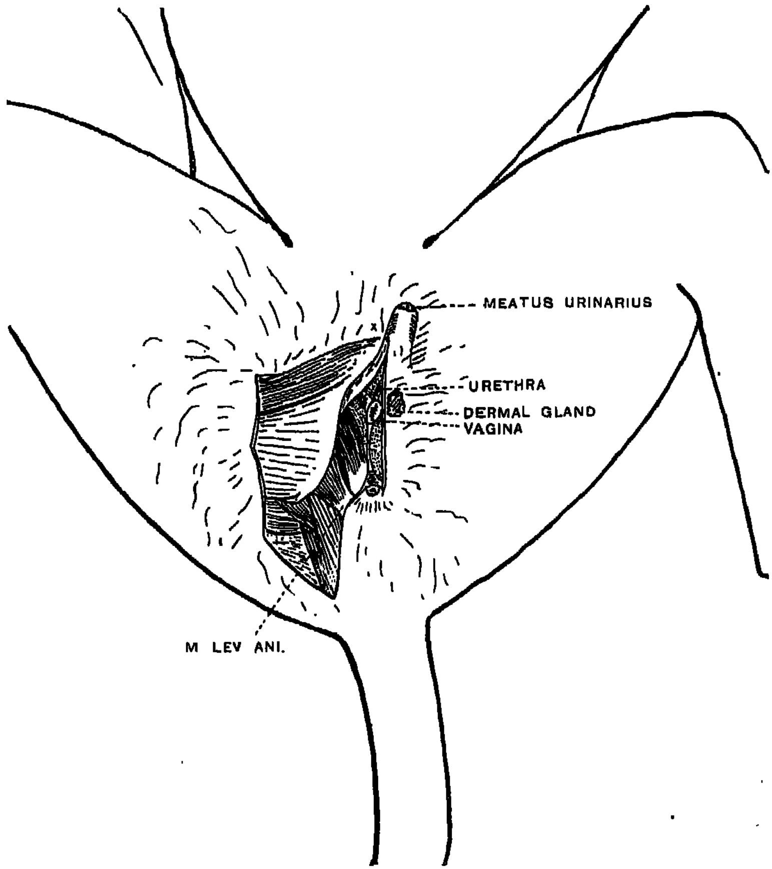


Fig. 1.

Mammary glands, represented by a minute papilla in either axilla.

The hair about the perineal region was disposed divergently, but showed distinct convergence at the anal opening.

Next the arrangement of the viscera was noted, the perineal region dissected, and the internal generative organs examined after division of the symphysis.

Finally the alimentary viscera were completely removed from the abdomen.

Urinary apparatus. In shape the bladder was conspicuously fusiform and elongated: though empty, it rose behind the anterior abdominal wall to a point quite 2 cms. above the symphysis. Representing the urachus was a minute fibrous cord in the free edge of a broad peritoneal

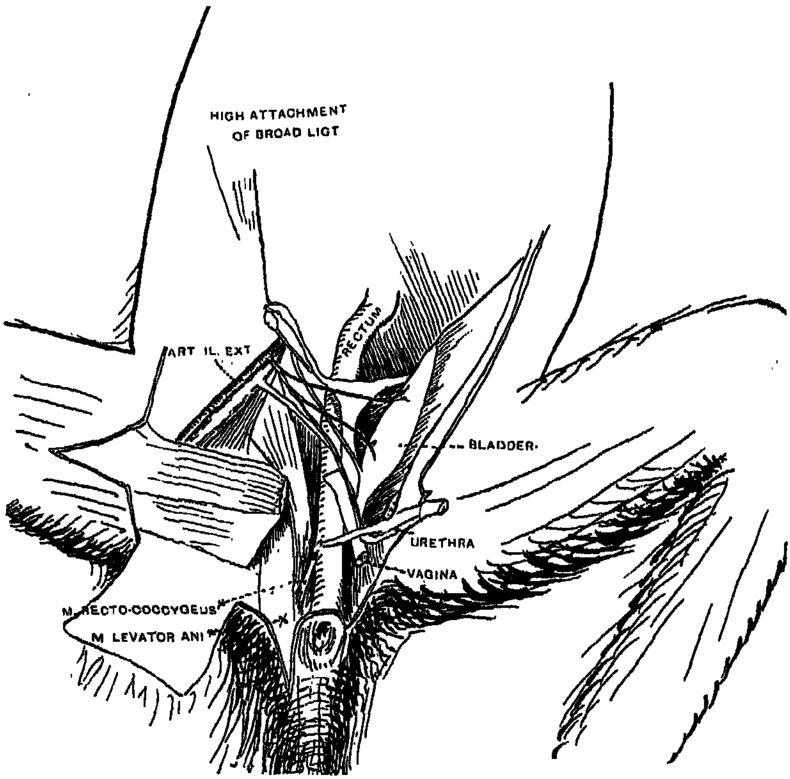


Fig. 2.

fold, which lodged several vessels in their passage to the viscus. At the upper level of the symphysis, the bladder received the ureters, and narrowing conewise passed into the thin-walled urethra, a tube attached by fibrous tissue to the ventral wall of the vagina. When dissected away from this the urethra was seen to pass under the arch of the strong crura clitoridis, and run upon the caudal surface of the clitoris to open at its extremity by a vertical meatus. This condition is an advance upon that described by Milne-Edwards and Grandidier (*Histoire naturelle des mammifères de Madagascar*) in Propithecus Edwardsi, wherein they

state that the urethra opens upon a fossa at the root of the clitoris, whose under surface is channelled as a means of guiding the urine to its extremity. In this species also the clitoris is pictured as hanging down over the vaginal opening, so as to hide the latter; but in the dissection of the Galago no trace of a vaginal opening at the base of the clitoris could be seen.

Internal generative organs. The peritoneal arrangements in the neighbourhood of the uterus were such that very deep utero-vesical and recto-uterine pouches were formed. The latter pouch was limited laterally by the broad ligaments of the uterus, reaching to an attachment as high as the kidneys upon either side.

The vagina, which was in close contact but not in communication with the urethra, was relatively very long, about 2 cms. Distally it abutted upon the hairless area of skin between the dermal glands noted above: this membrane absolutely barred the vaginal passage from an opening upon the external world. Longitudinal rugæ marked the inner wall of the vagina, diverging in a couple of bundles to lateral recesses which appeared on either side of the uterine mouth. These recesses were so marked that the vagina was in form a duplicate of the uterus.

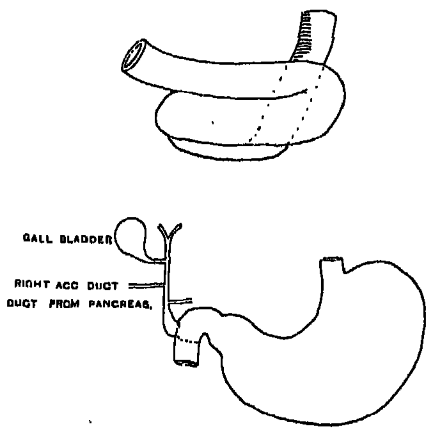
From the uterus, which was single, passed Fallopian tubes to embrace either ovary. Arising from the root of the Fallopian tube, and not from the fundus uteri, a fibrous band crossed to fatty tissue in the lateral abdominal wall at the brim of the pelvis and below the level of the symphysis. The ovary was unscarred and attached by a strong ovario-uterine ligament. As remarked before, the peritoneal fold holding the ovary and Fallopian tube passed up to a high attachment over either kidney.

Neither the naked eye nor the microscope could discover corpora lutea in the ovary[1]. The animal then had never menstruated, and, thanks to the peculiar course of the urethra, would probably not have been inconvenienced by the closure of the vaginal passage. Undoubtedly it was a female; if adult, the minute size of the mammæ would indicate that the presence of the membrane was abnormal, and sufficient to arrest development of the secondary sexual organs.

[1] *Addendum.* Many large ova were present in the ovary, one or two of the follicles being very near maturity. This confirms the opinion that the animal was adult. Walter Heape has shown (*Proc. Roy. Soc.*) that menstruation may occur in Macacus Rhesus and Cercopithecus Entellus without ovulation. Hence the argument against the occurrence of previous menstrual discharges fails. Furthermore he found that corpora lutea were not occupied by blood clots, as in the human female, and soon became indistinguishable from the ovarian stroma. Hence the only deduction from the histological examination of the ovary which is permissible, is that the animal had reached the age of puberty but had not recently ovulated.

A few points were noted in the arrangement of the viscera and peritoneum.

The stomach was of simple shape: the cœcum was large, dilated, and bent to a semicircle, but did not exhibit a special vermiform appendix. From the hepatic flexure the transverse colon (fig. 3) swung inwards and downwards for 5 or 6 cms., then turned abruptly back to the right for 5 cms., and once again to the left. Each succeeding loop so formed was dorsal to its predecessor. Finally the colon at the left extremity of the lowest loop turned up behind the zig-zag and ascended, narrowing, to its flexure behind the stomach.



Figs. 3, 4.

No appendices epiploicæ were attached to the colic tube, but much fat was stored in its peritoneal suspensory folds.

From the rectum, about 1·5 cm. above the anus, was given off a distinct slip of plain muscle tissue, the recto-coccygeus. (Cf. fig. 2.)

Peritoneum. The relations of this were comparatively simple, for, though intestinal rotation had occurred, secondary peritoneal attachments had not yet been gained by the viscera.

A large mesoduodenum existed, so that this part of the small intestine and the pancreas could be freely raised from the posterior abdominal wall. Owing to the rotation of the gut the duodeno-jejunal flexure was close to the left flexure of the colon. The mesentery of the small intestine had not acquired the later attachment evident in the human abdomen, but still took origin by a root common to it and part of the transverse colon from within the duodenal loop. Nothing corresponding to a Meckelian diverticulum could be perceived.

The ilio-cœcal orifice was placed high, although the elongated cœcum reached almost to the pelvic brim. The descending colon and rectum were anchored to the median line by a large posterior mesentery: but by displacement to the left the descending colon shows the first stage of formation of what in the human is normal, viz. an inchoate mesocolon arising from the upper half of the body of the left kidney: this illustrates the formation of the retro-sigmoid peritoneal pouches in man.

The foramen of Winslow is large and patent: passing behind the stomach the lesser peritoneal sac expands into the cavity of the great omentum. As in the human fœtus, the great omentum is connected only with the right half of the transverse mesocolon: in its left border runs the tail of the extended pancreas.

Liver (fig. 5). Large and multilobulate. The preaxial portion is almost equally developed upon either side of the median plane as indicated by the falciform ligament. An exceedingly deep fissure subdivides the left

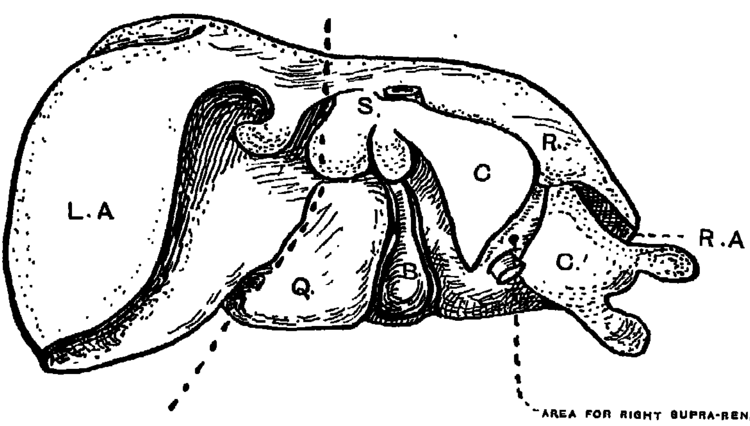


Fig. 5.

S. Spigelian lobe. *R.* Right lobe. *C, C'.* Caudate lobe. *Q.* Quadrate lobe. *L.A.* Left accessory lobe. *R.A.* Right accessory lobe. *B.* Gall-bladder.

preaxial half so as to mark off a large left accessory lobe, which overlaps the stomach and comes into linear relation by its lower border with the spleen. A pons of hepatic substance joins the left with the quadrate lobe across the obliterated umbilical vein. The right

accessory lobe is smaller, but is prolonged on the inner side so as to partially hide the gall bladder and almost meet the right edge of the quadrate.

The postaxial group behind the porta is well defined, but small, and almost entirely in relation with the right accessory lobe. A large Spigelian lobe lies between the ductus venosus (this secondary anastomosis had been existent in the fœtal Galago) and the inferior vena cava.

To the right of the vena cava and below the right accessory is a free caudate lobe with digitate edge.

From the right accessory lobe proceeds a duct to join the common bile duct between the origin of the cystic duct and the duodenum. The common duct is then joined by the pancreatic, and at once enlarges into a conical diverticulum Vateri of 1 cm. length. Cf. fig. 4. But the actual orifice upon the duodenum is minute and partly sheltered by a cushion.

The right kidney was higher than the left by its own length, and its connective tissue was in close connection with the right crus of the diaphragm. But the left suprarenal shared but slightly in the descent of the kidney, for it lay close to the vertebral column above the latter and almost on a level with its fellow of the opposite side.

The blood vessels of the limbs are not subdivided as in Nycticebus.

NOTES ON THE DISSECTION OF THE HEAD OF AN ABORIGINAL OF AUSTRALIA.

(Compiled with the assistance of R. MOORE, Esq., B.A., Christ's College, Cambridge.)

THE head in question had been partially dissected by Professor Macalister. The brain has been removed, and the facial muscles carefully cleaned and dissected. The present account deals principally with the muscular attachments in the neighbourhood of the mastoid process and pterygoid plates. The palate presents the following characters. It is extensive and elliptical in contour. Palatal ridges are very distinct. The soft palate is long, very thick, and marked on its upper (nasal) surface by a prominent thickened ridge, running mesially in a position corresponding to the azygos uvulæ muscle. The uvula is bifid.

The teeth are much worn, and on the right side the upper canine and first premolar teeth are in an advanced stage of caries, a rare condition in Australian aborigines.

The principal dimensions of the palate are:

Transverse diameters at 2nd molars:
- external ... ... 65 mm.
- internal ... ... 42·7 mm.

Sagittal diameter:
- from prosthion to post-palatine spine 61 mm.

The muscular attachments in the regions adjacent to the mastoid process presented the following appearance, the notes being arranged under the headings of the several muscles.

M. retrahens aurem: on the right side has been removed: on the left side, it forms a distinct band 35·5 mm. long by 4·7 mm. wide, crossing the tendinous insertion of the M. sterno-mastoideus.

M. occipitalis: on the right side arises from the outer half of the superior nuchal line and extends to within 25 mm. of the temporal ridge: it is a thin band 57 mm. wide. On the left side, it forms a similar wide (45 mm.), thin sheet.

M. styloglossus: on the right side arises from the anterior aspect of the styloid process close to its free extremity: no origin from the ligament: the styloid origin is mainly tendinous. The muscle has not been left on the opposite side.

M. stylo-pharyngeus: on both sides arises from the superior half of the inner surface of the styloid process: the origin being entirely by muscular fibres and covering an extent of 18·5 mm. on the right, 15·2 mm. on the left side.

M. stylo-hyoideus: has been cut away on both sides.

The styloid process is stout and long: this is unusual in crania of aborigines of Australia: the length of the right process is 33·2 mm., of the left 31·4 mm. (measurements being made along the outer aspect).

The following notes refer to muscles on the left side only.

M. obliquus superior (capitis): inserted into the inferior curved line and adjacent part of the occipital bone: the insertion is mainly covered by the M. complexus, but extends slightly beyond the margin of the latter muscle.

M. rectus capitis posticus major: inserted into the outer part (34 mm. wide) of the inferior curved line and adjacent bone: divided into two distinct muscular slips of equal size (on the right side no such division is seen).

M. rectus capitis posticus minor: insertion into the inner part (24 mm. in extent) of the inferior curved line, and about the distal half of the surface between this line and the foramen magnum. It is quite equal in size to the M. rectus capitis posticus major, and is slightly overlapped by it.

M. digastricus: attached to the anterior part of the digastric groove largely under cover of the trachelo-mastoid: the anterior fibres are chiefly muscular, while posteriorly, tendinous fibres predominate. The occipital artery is, as usual, deeply situated in regard to this attachment.

M. rectus capitis lateralis: inserted into the jugular eminence posteriorly and internally to the styloid process, and between this and the next muscles.

M. rectus capitis anticus major: }
M. rectus capitis anticus minor: } these are attached to the basi-occipital bone close to the mid-line and immediately in front of the foramen magnum.

A large vein is seen (? coming through the anterior lacerate foramen), passing down on the constrictors between these and the internal pterygoid muscle: it takes a very tortuous course anteriorly to the ascending pharyngeal artery, to which it seems to correspond, though greatly exceeding it in size: it receives numerous pharyngeal tributaries.

M. splenius: its width near its insertion is 55 mm.: in the mode of insertion it corresponds closely with the normal conditions as described in Cunningham's *Practical Anatomy*. Its internal border coincides closely with the internal border of the sterno-mastoid muscle, and the fibres of insertion are pierced by those of the anterior part of the same muscle.

On the left side (not on the right), a small accessory slip arises from the mastoid process, anteriorly, and slightly external to the anterior limit of insertion and under cover of the sterno-mastoid muscle: its other attachment is not present.

The occipital artery lies deeply to the posterior three-fourths of the muscular attachment of the splenius muscle, and winds round its posterior margin.

M. trachelo-mastoideus: the muscle is inserted into the anterior and lower border of the mastoid, its anterior limit coinciding with that of the M. splenius: in extent it measures 20 mm.

M. trapezius: this muscle is attached to the external occipital protuberance and along the superior curved line of the occiput for a distance of 27 mm.: the fibres of insertion are mainly tendinous. An anomalous muscular slip is seen deep to the trapezius muscle and in the middle line.

M. sterno-mastoid: this muscle is inserted by fibres which intersect those of the M. splenius, into the upper portion of the base of the mastoid process: beyond this it extends along rather less than the outer half of the superior curved line of the occiput. (Normally in white races, the extent is rather more than half:—Cunningham.)

M. complexus: the muscle is inserted in the area between the superior and inferior curved lines of the occipital bone, extending outwards to a distance of 50 mm. from the median occipital ridge, near which the great occipital nerve pierces it, cutting off a distinct slip superficial to the rest of the muscle (this slip is found on both sides). Superficially to the M. complexus lies the occipital artery near its attachment and upon about its outer third. Deep to the muscle are the M. recti postici major and minor, and the M. obliquus superior.

The pterygoid muscles were next observed.

M. pterygoideus externus: on left and right sides alike the conditions are similar: two heads, as usual, are seen; the upper arises from the infra-temporal ridge, and the lower from the whole external surface of the external pterygoid plate.

M. pterygoideus internus: the anterior head which is small, arises from the lower part of the tuber maxillare: the posterior head is much larger and arises from the internal surface of the external pterygoid plate.

M. masseter: on both sides this muscle has been cut away.

The following notes refer to other structures than muscles.

I. *The internal maxillary artery*:

Right side: cut short on the surface of the M. pterygoideus externus: it disappears into the pterygo-maxillary fossa above the external pterygoid, and there breaks up into terminal branches. Of the branches that remain, the middle meningeal, anterior deep temporal, and posterior superior dental are recognisable, but present no anomalies.

Left side: conditions very similar to those on the right side: the middle meningeal and posterior superior dental branches are normal in appearance.

II. *The inferior maxillary division of the Vth nerve* gives off the chorda tympani in the normal manner: a large branch comes off from this division of the Vth nerve while still in the foramen ovale.

DESCRIPTION OF BRAINS OF PRIMATES IN THE UNIVERSITY ANATOMICAL MUSEUM, CAMBRIDGE.

THE Anatomical Department has received during the last five years collections of unusual value and number from Charles Hose, Sc.D., Resident in the Baram district of Sarawak, Borneo. Among the specimens thus acquired are numerous brains of primate mammals, especially those of the genera Semnopithecus, Nasalis (Cercopithecidæ), Hylobates and Simia (Simiidæ). To these must be added examples of brains of the rare *Tarsius spectrum* (Lemuroidea, Tarsiidæ).

In the following pages will be found notes on several of these examples with references to descriptions of specimens selected as typical from the large collection in the Museum of the Royal College of Surgeons in London, which has been exhaustively described recently by Professor Elliott Smith (cf. *Catalogue of the Museum of the Royal College of Surgeons, London*: Physiological Series: Central Nervous System, Part II. 1903).

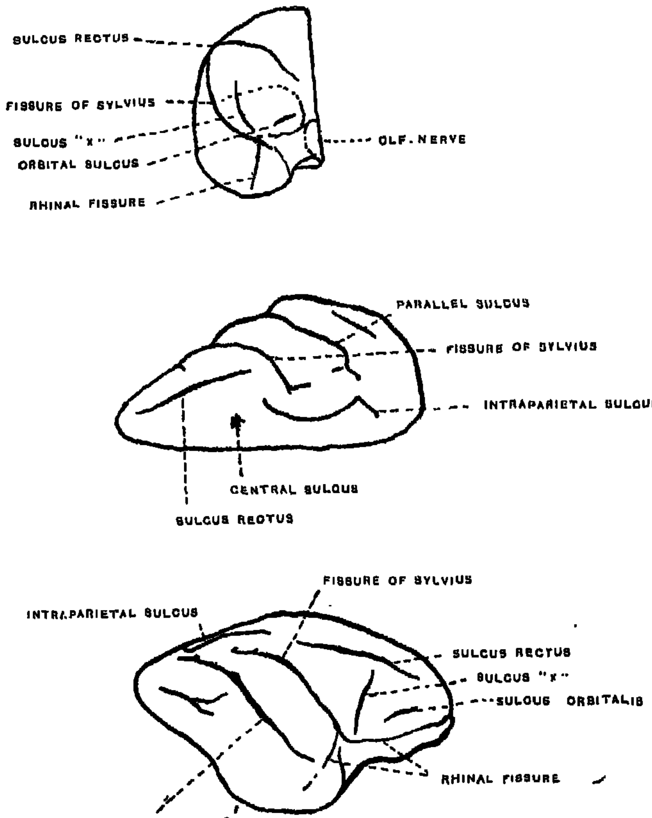
Lemur (? species) 1. *The right hemisphere only. Fig.* 1. [*Type-specimen Mus. R.C.S. D.* 533.]

The sylvian fissure is turned slightly backwards at its upper and posterior end. The depression indicative of the sulcus centralis of higher forms is rather more distinct than in the typical example. The sulci described in connection with the type form as representatives of the inferior temporal sulci are here well seen: that spoken of previously as the second, recalls in its position, the sulcus described in the brains of higher forms as the collateral. The foregoing are the only remarks called for: otherwise the agreement with the features of the type specimen is very close.

Lemur (? species) 2.

Several points in connection with the characters of the convolutions and sulci call for notice here. In the first place, the posterior, *i.e.* post-sylvian, part of the rhinal fissure is so shallow as to be practically

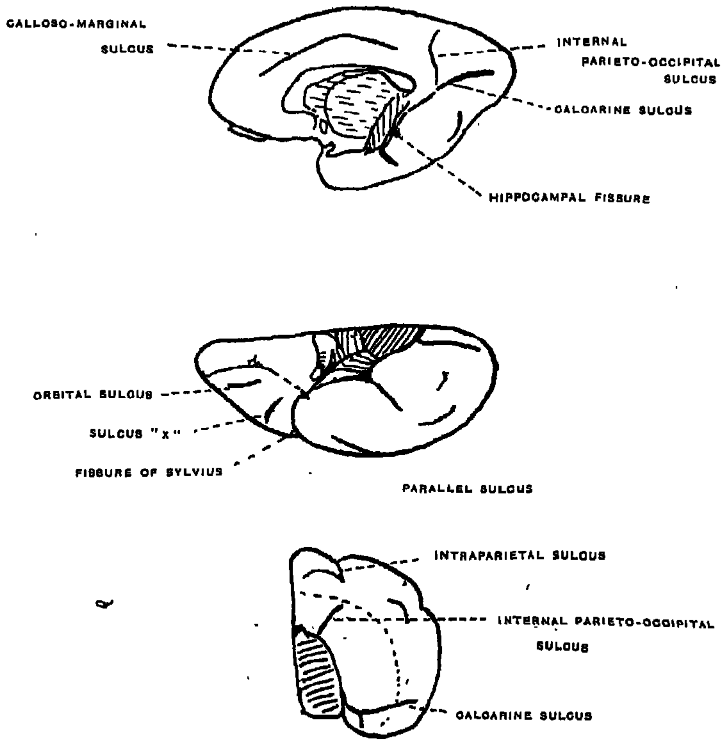
non-existent. Of the sulci anterior in position to the sylvian fissure, the representative of the pre-sylvian of other forms is very faintly marked and the same remark applies to the orbital of the left hemisphere (not so on the right side).



Figs. 1, 2, 3.

Thirdly, the region of the parallel sulcus is interesting. In each hemisphere this sulcus is apparently of unusual length and this is due to its fusion with the small sulcus found more commonly isolated in a situation above and behind the termination of the normal parallel sulcus. The junction of the two can still be made out in the right (but not in the left) hemisphere, being indicated by a short branch running backwards from the parallel sulcus, in the direction of the occipital pole

of the hemisphere. The elongated form of parallel sulcus thus produced tends at its upper end to curve round the extremity of the sylvian fissure and this gives strong support to the view expressed as to its nature by Ziehen.



Figs. 4, 5, 6[1].

Between the parallel sulcus and the margin of the temporal lobe are two short sulci in the right hemisphere (one only in the left hemisphere) more or less in line and parallel to the parallel sulcus itself. These short additional sulci are much better developed here than is usually the case in the brains of Lemurs. On the mesial aspect of the hemisphere the pars genualis of the splenial sulcus is not visible. The sulci referred to in the typical description as the inferior temporal sulci are here

[1] The sulcus designated "internal parieto-occipital" in figures 4 and 6 is better termed "paracalcarine," for its identity with the internal parieto-occipital sulcus of the higher Primates still awaits establishment.

developed in an interesting way. The sulcus spoken of as "the second" is here distinctly larger than usual and semilunar in form instead of being rectilinear. This holds good for each hemisphere. Posteriorly, in each hemisphere, it is almost but not quite confluent with the third sulcus, which is here feebly developed in each hemisphere. The form of the "second" sulcus in this specimen leaves little room for doubt that it is homologous with the sulcus called "collateral" in Chrysothrix and allied higher forms (though its identity with the sulcus of that name in the human brain must remain doubtful).

Lemur (? species) 3.

While the foregoing specimen presented (among others) certain conditions constituting a higher degree of complexity than is usual among the brains of Lemurs, the present example differs in offering variations consistently in the direction of simplicity. The pre-sylvian sulcus is so shallow as to be barely recognisable: the intraparietal is sinuous, and lacks the angular flexure in its hinder portion: the parallel sulcus is rectilinear and, in comparison with the foregoing example, short: the small irregular sulci at its upper and posterior end are not present, nor is there anything more than an almost punctate depression between the parallel sulcus and the lower margin of the temporal lobe. On the mesial aspect no trace of the pars genualis sulci splenialis can be seen. In other respects the description given for the type-specimen is here applicable.

In all the three preceding specimens the rudiment of the central sulci of higher forms is reduced to a single depression.

Loris gracilis (*Type-specimen; Mus. R.C.S.* 1337 *Ah.*). *Fig.* 7. [*The brains here represented are, from left to right, those of Perodicticus potto, Loris gracilis, and Galago crassicaudata.*]

The following remarks must be made in connection with this specimen: the sulcus referred to in the description of 1337 Ah., is here

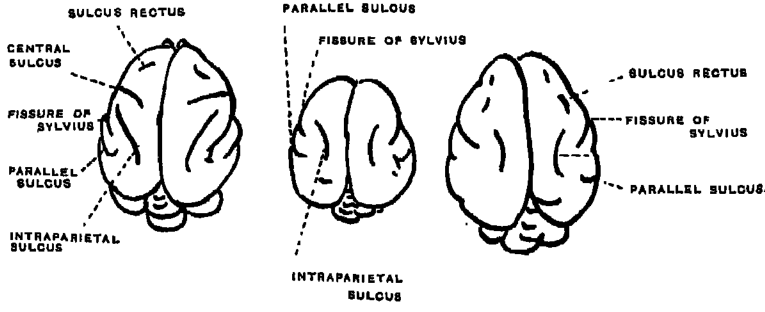


Fig. 7.

not certainly distinguishable in either hemisphere, in fact with the exception of the anterior rhinal fissure, there are no sulci which can be distinguished from faint vascular grooves at the frontal end of the brain (in either hemisphere). No alterations in the descriptions of the sylvian fissure or intraparietal sulcus are needed. Behind the termination of the latter, and separated by about 2 mm. of an intervening gyrus, there is a faint transverse, *i.e.* coronal, depression in the left hemisphere, and this may represent the detached pars transversalis of the intraparietal sulcus. A very faint vascular groove occupies a corresponding situation in the right hemisphere. The parallel sulcus is of interest in both hemispheres. In the right hemisphere, there is seen above the upper and posterior end of the parallel sulcus, a sulcus running almost perpendicularly to it, from the margin of the temporal lobe to the region of the upper end of the sylvian fissure. Above and parallel to this sulcus is another and much shorter one. They are both probably referable to the supra-sylvian system, though only the upper part of the first of the two ought strictly to be regarded as falling within that category.

The parallel sulcus, it remains to be said, is in the right hemisphere very short. On the opposite side, the parallel sulcus is longer and is bent sharply forward at its upper extremity, the bent portion making an angle of about 110° with the rest of the sulcus.

Immediately posterior to the point of flexion, but about 2 mm. distant, is a small "punctate" sulcus; this and the reflected part of the parallel, are representatives in the left hemisphere of what in the right hemisphere is an independent sulcus. Thus the difference in the two hemispheres of this individual is, in this respect at least, considerable.

No distinct sulcus is made out between the parallel sulcus and the lower margin of the temporal lobe: herein the brain in *Loris gracilis* is simpler than that of most Lemurs.

The same irregularity of the cortex about the upper end of the parallel sulcus occurs in Loris as in Lemur. In neither has it attained a position of stability.

Galago garnetti (*Type-specimen* 1337 *B*, *Mus. R.C.S.*). *Cf. Fig.* 7.

As regards the rhinal and the sylvian fissures, the description given for 1337 B is quite applicable. With the description of the intraparietal sulcus, we meet with the first of a series of differences. In both hemispheres the intraparietal sulcus though slightly sinuous, lacks the posterior offshoot described in the type-specimen. Nor is there any sulcus between it and the occipital pole, though the spot occupied by the short sulcus referred to in the type-specimen, as a possible representative of the detached terminal part of the intraparietal sulcus, is marked by an almost imperceptible depression. In both hemispheres the

parallel sulcus is extremely feebly developed, more particularly on the left side: but on the right side, the sulcus is clearly distinguishable from the vascular grooves found near it. No other sulci occur behind the sylvian and the intraparietal sulci. Anteriorly and in each hemisphere will be found a faint rudiment of the sulcus rectus, more distinct on the right than the left. The same difference between the two sides holds good for the feeble orbital sulci. No other sulci mark the lateral convexity of the cerebrum.

On the mesial aspect, no appearances are seen which necessitate any addition to or alteration of the typical description. It will thus be seen that this brain and that of the *Galago garnetti* (1337 Bb) at the Royal College of Surgeons are closely similar to one another.

Nasalis larvatus, No. 188 [*Type-specimen* 1338 *F. Semnopithecus entellus. R. C. S. Museum*]. *Fig.* 8.

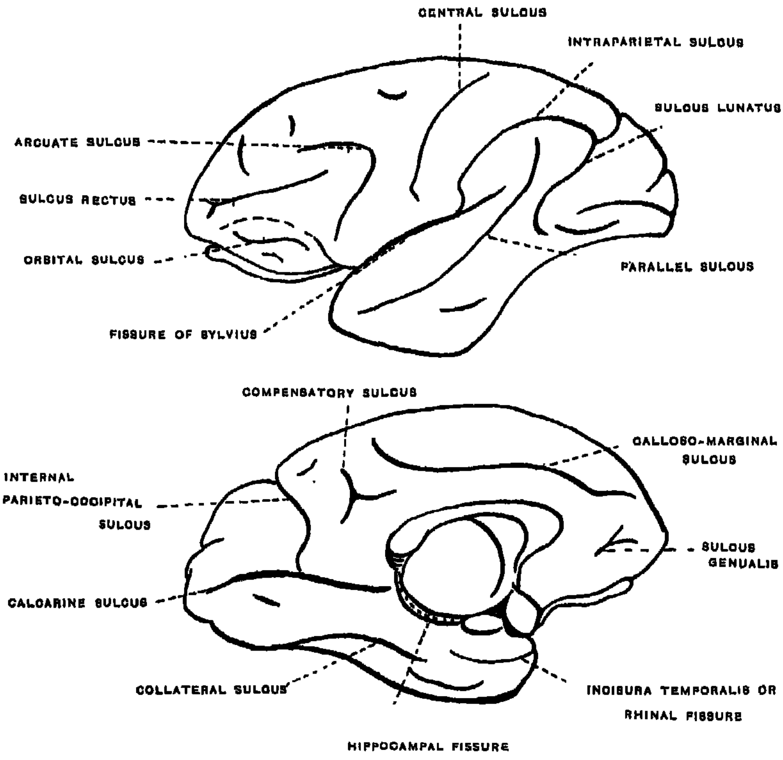


Fig. 8.

The left hemisphere has been detached from the rest of the encephalon. It is somewhat remarkable as a confirmation of the nearness of the relation of this form to Semnopithecus, that the plan of the cortical fissures and convolutions should be practically identical in both.

Nasalis larvatus, No. 3, 188 *b* [*Type-specimen: Semnopithecus entellus,* 1338 *F.A.C. Mus. R.C.S.*].

This specimen differs from the type in respect of the pars post-centralis superior of the intraparietal sulcus, which is here rudimentary and represented by a circular depression only, better marked in the left than in the right hemisphere. There is no sulcus transversus below the central sulcus, and the precentral sulcus is represented by two very faint depressions in the left hemisphere, and a hardly recognisable depression in the right hemisphere. The inferior occipital sulcus is short and shallow in the left hemisphere, and in the right hardly recognisable: the other occipital furrows are not so well developed as in the type-specimen, though they are distinct. The calcarine runs out on to the lateral convexity of the occipital lobe as in the type-specimen.

As regards the mesial aspect, the specimen also agrees remarkably closely with the type-specimen.

Nasalis larvatus, 188 *c*, *Hose don*[n] 3 [*Type: Mus. R.C.S.* 1338 *Fa.*].

The cerebral hemispheres of this specimen have been separated from the lower parts of the encephalon. The general characters of the brain require no special mention: the arrangement of the fissures and convolutions follows fairly closely that of the type-specimen. The following points appear worthy of special mention in the left hemisphere.

The sylvian fissure presents no trace whatever of an incipient anterior limb of the fissure of Sylvius (though such an incipient fissure is visible on the right side of the brain).

Below the lower end of the Affenspalte are two inferior occipital sulci of sinuous outline and running almost sagittally in direction skirting the inferior margin of the hemisphere. A fissure here runs out from the mesial aspect where it is seen to be continuous with the collateral system of sulci.

The Affenspalte differs slightly on the two sides; on neither side is the *floor* of the transverse occipital sulcus continuous with that of the internal parieto-occipital sulcus, but in the right hemisphere, it runs over well on to the mesial aspect of the hemisphere: on the left side the part that runs over on to the mesial aspect is separated by a

submerged gyrus from the rest of the Affenspalte. In both hemispheres the intraparietal sulcus runs into the transverse occipital. On the mesial aspect the calcarine ends posteriorly by turning sharply upwards (in each hemisphere), suggesting the upper limb of bifurcation of the calcarine of most Cercopithecidæ; the internal parieto-occipital sulcus does not run into the calcarine.

The collateral system is represented on the left side, by an inner and an outer sulcus, the inner being long, though not reaching the calcarine; the outer short and running posteriorly over on to the lateral convexity. Very different is the arrangement in the right hemisphere: the two upper sulci (an anterior triradiate and a posterior linear) represent the inner component of the system in the left hemisphere: while the representative of the outer sulcus of that side is here linear and much reduced in complexity: it just reaches the lateral convexity.

The foregoing are all the remarks specially called for by this specimen which otherwise, as has already been said, closely agrees with that selected as typical of the genus Semnopithecus. (N.B. the occipital operculum of the right hemisphere was subsequently dissected away so as to expose the underlying submerged gyri.)

Brain of Nasalis larvatus, 188 *d.* (*Specimen presented by C. H. to W. L. H. D. August* 1898) [*Type-specimen Mus. R.C.S.* 1338 *Fa.*].

This specimen presents in reference to the fissures and sulci of the cerebral hemisphere one or two points which deserve special notice. On both sides the representative of the pars postcentralis superior of the intraparietal sulcus is absent. On the other hand the intraparietal sulcus itself gives off (at the summit of the arch which it describes on the surface of the hemisphere) a short rectilinear branch which might be regarded as compensatory to that which is absent. The upper precentral sulcus is indicated in each hemisphere by a deep linear groove nearly sagittal in direction. This sulcus is much more distinct than in many brains of Semnopithecus, and in all the (3) other Nasalis brains (6 hemispheres) it is less well marked than in the present instance

The Affenspalte exhibits in each hemisphere an interesting stage in the transition from the type found in Macacus and other low Cercopithecidæ, to that found in Hylobates, for the convolution surrounding the end of the internal parieto-occipital sulcus, which is submerged in the Macacus brain, has here almost but not quite completely emerged. The inferior occipital sulcus is more definite and rectilinear than in the other specimens of Nasalis (and most Semnopitheci) and recalls the character presented by this sulcus in Macacus.

Brain of Ateles variegatus (*Fig.* 9). [*Type-specimen, Mus. R. C.S.* 1337 *He.*]

The left hemisphere has been detached from the rest of the encephalon and may be described first. The general description given for the

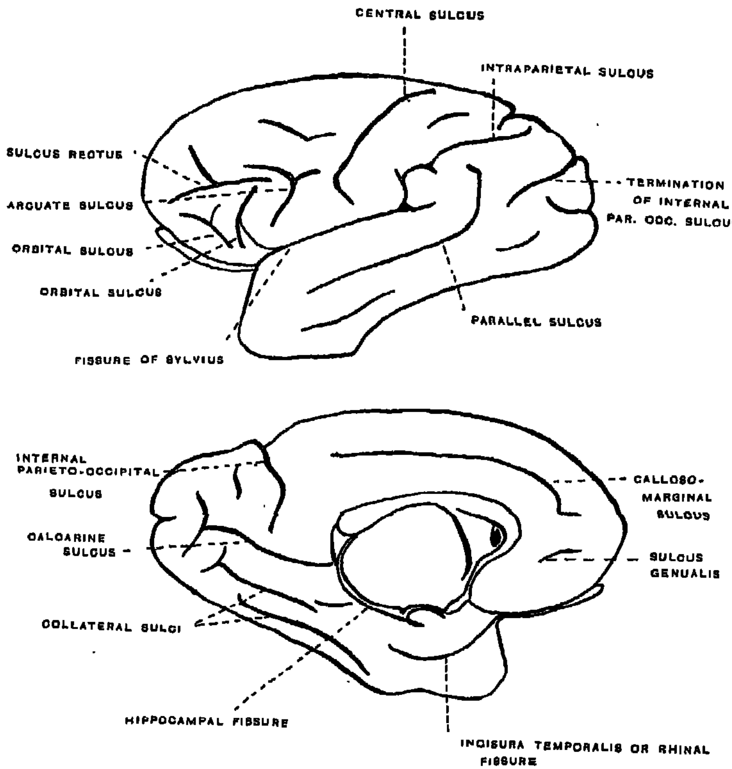


Fig. 9.

cerebral fissures and sulci in 1337 He. applies fairly well here. There are one or two slight alterations needed however. Firstly the dividing gyrus between the sylvian fissure and the parallel sulcus is much better marked in this specimen than in that taken as the type (herein Ziehen's drawing[1] receives justification): the upper precentral sulci in the left hemisphere of this specimen are merely linear, though in the right hemisphere they conform to the description. A deep sulcus passes up over the supra-orbital margin and is not too far forward to be a fronto-orbital sulcus (corresponding to that so named in

[1] *Jenaische Zeitschrift*, Bd. xxix.

Man)[1]. The occipital end of the hemisphere is rather less richly convoluted than in 1337 He. and in particular the inferior occipital sulcus is only represented by two linear depressions: beyond these, *i.e.* towards the occipital pole, a deeper fissure cuts into the cortex and probably represents one of those described in 1337 He. as superior in position to the inferior occipital sulcus.

The other sulci conform to the typical description. On the mesial aspect, the same remark applies. Note that the collateral is represented by two sulci. Otherwise no special description is necessary.

Hylobates mulleri I. Fig. 10.

The right hemisphere has been detached from the remainder of the encephalon. As regards the general characters of the fissures, sulci and

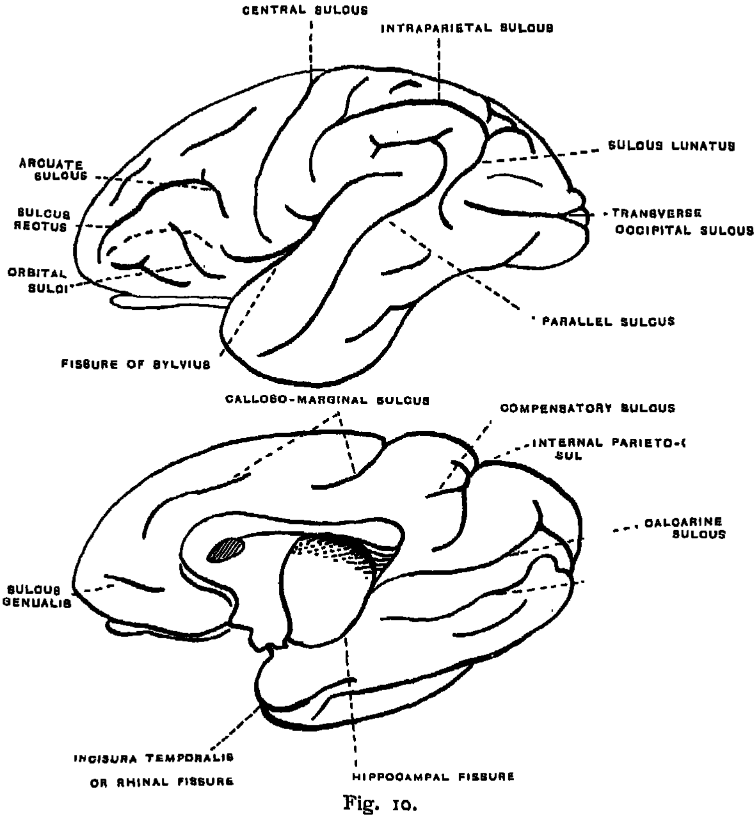


Fig. 10.

[1] I am inclined to think it must be admitted that the fronto-orbital may be occasionally developed in quite a lowly type of brain.

convolutions, the following notes refer to the left hemisphere. The general arrangement is very similar to that of the type-specimen (Mus. R.C.S. 1338 Ga.).

The superior limiting sulcus does not join the fronto-orbital. On the mesial aspect, the calcarine sulcus bifurcates posteriorly and is not joined by the internal parieto-occipital.

The right hemisphere of the same brain presents few special characters; the independence of the pars postcentralis superior sulci interparietalis may be mentioned: the sulcus rectus bifurcates posteriorly and shows the fusion here of the "arcuate" with the "straight" element. Mesially, the principal point to notice is the division of the calloso-marginal sulcus into anterior and posterior parts which do not join, and the posterior of which runs upwards on to the lateral convexity. The exact arrangement is obscured, as by a remarkable coincidence the bullet which deprived the animal of life has lodged at the point of division and has broken up the surrounding cortex somewhat. The other sulci require no special mention, except that three sulci represent the collateral system. This specimen shows very clearly an advance on the condition common in the upper part of the Affenspalte in Semnopithecus and Nasalis. The following diagrams, Fig. 11, will show what is referred to.

(i) The essential point is that the gyrus x which had only partially emerged in Nasalis, has made its appearance definitely on the surface in Hylobates.

The lower part of the occipital operculum persists however.

(ii) Another point is the possession (by Hylobates) of an inferior occipital operculum (fold "op.") which is not fully indicated in Semnopithecus, though strongly marked in Macacus. The following points are not shown in the diagram.

(iii) The arcuate sulcus and the sulcus rectus are confluent.

(iv) The outer limb of the H-system of sulci on the orbital surface of the frontal lobe here forms a fronto-orbital sulcus running upwards over the supra-orbital margin.

(v) The frontal operculum now asserts itself and a distinct overlapping fold is demarcated by an incipient superior marginal sulcus of Reil, and note moreover that whether vascular strands have any influence in creating the fissure or not, nevertheless there was here found in the superior limiting sulcus of Reil (and also in the fronto-orbital sulcus) a distinct vessel.

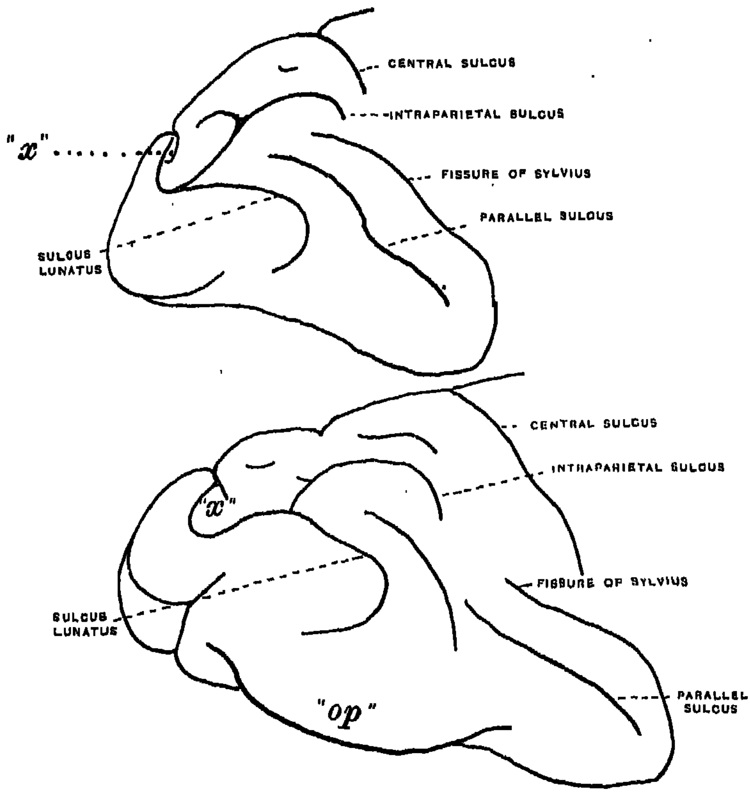


Fig. 11.

The upper hemisphere is that of a specimen of Nasalis larvatus, the lower that of an example of Hylobates mulleri.

(vi) The parallel sulcus tends to turn round the upper end of the sylvian fissure.

(vii) The upper precentral sulci for the first time become clearly marked. They are two in number, and more or less sagittal in direction.

The mesial aspect.

Presents comparatively few features of interest. The combination of sulci in the "collateral" region is perhaps most noteworthy.

Hylobates mulleri II.

The left hemisphere has been detached from the remainder of the encephalon. The fissures, sulci and convolutions of the left hemisphere agree closely with those of the type-specimen [1338 G., Mus. R.C.S.].

The following points seem noteworthy.

(i) The presence of a sulcus above the upper and posterior end of the parallel sulcus.

(ii) The fronto-orbital sulcus appears remarkably clearly as the outer limb of the H-shaped complex on the orbital surface of the frontal lobe. The sulcus limitans superior of Reil does not meet the fronto-orbital sulcus, though a vascular furrow forms a superficial connection between them. The sulcus rectus shows practically no evidence, except in its extent in the posterior direction, of its fusion with a sulcus arcuatus.

The sulci on the mesial aspect require no special comments. (N.B. the internal parieto-occipital sulcus does not unite with the calcarine: an intercalated sulcus is present: the calcarine sulcus bifurcates posteriorly, sending a (lower) limb over on to the lateral convexity: three sulci are seen as representatives of the collateral system.)

In the right hemisphere very few points call for special mention. The great upward prolongation of the parallel sulcus is remarkable and rare. In this, as in the last hemisphere, a small depression below the central is the representative of Ecker's transverse sulcus of the human brain.

The same remarks apply here (as to the left hemisphere) as regards the superior limiting sulcus of Reil and the fronto-orbital, calcarine, internal parieto-occipital and collateral sulci. The extreme posterior end of the calloso-marginal sulcus is separated by a shallow depression from the anterior part of the sulcus.

Hylobates mulleri III.

The left hemisphere which has been detached from the rest of the encephalon presents the following features of interest as regards the fissures, sulci and convolutions.

The superior limiting sulcus of Reil almost joins the fronto-orbital sulcus. The internal parieto-occipital sulcus on the mesial aspect runs superficially into the calcarine. In other respects the agreement of this specimen with the selected type is very close. Notice *inter alia* the dimensions of cerebrum, viz. breadth 54 mm., length 63 mm. (R.) and 62 mm. (L.), height 41·5 mm. The pars postcentralis superior of the

intraparietal sulcus is separate from the rest of that sulcus: behind its upper end, the calloso-marginal sulcus just emerges on the lateral convexity of the hemisphere: in a somewhat similar way, a branch of the calcarine sulcus just reaches the lateral convexity at the occipital pole. The internal parieto-occipital sulcus joins no other sulcus externally, but on the mesial aspect it joins the calcarine sulcus superficially. Three sulci represent the collateral series. These remarks apply almost without modification to the several sulci of the right hemisphere; in this hemisphere is clearly seen the modification of the outer limb of the H-shaped system of orbital sulci into a fronto-orbital fissure.

The island of Reil, which has been exposed in the left hemisphere, bears a centrally situated oblique groove which looks rather deeper than a mere vascular impression, an example of which is also seen in the anterior part of the insula: the groove first mentioned may very well be a rudiment of the sulcus centralis insulæ of higher forms: but on the other hand the sylvian artery being relatively very large might also be accountable for it.

MEASUREMENTS OF A NEGRO (KROO-NATIVE).

	Millimeters
Stature (vertex to heel)	1694
Vertex to tip of coccyx	811
Vertex to umbilicus	643
Vertex to tuber ischii—sitting height	856
Umbilicus to heel	1050
Umbilicus to upper border of symphysis pubis	136
Height of symphysis pubis ...	40
Span of arms	1654
Upper limb—total length ...	768
Arm	301
Forearm	238
Ulna	? 260
Breadth of palmar surface ...	94
Length—pollex	63
„ index	74
„ medius	77
„ annularis	69
„ minimus	55
Upper margin of symphysis pubis to heel	892
Anterior sup. iliac spine to adductor tubercle	454
Length—thigh	454
„ leg	415
„ pes	217
„ hallux	47
„ second toe	37
„ third toe	29
„ fourth toe	26
„ fifth toe	23

	Millimeters
Face:	
Supra-orbital margin to chin	125
Maximum bi-zygomatic breadth	122
External bi-orbital breadth	124
Ear—height	65
„ breadth	36
„ index	55·4
Circumferences:	
Maximum thoracic ...	900
Abdomen	852
Arm	312
Forearm	292
Thigh	443
Leg	367
Pollex	74
Hallux	87
Mouth—angle to angle ...	45
Eye—rictus	30
„ interorbital breadth...	33
Nose—height	49
„ width	43
Circumference of head ...	562
Breadth of head	120
Length of head	151
Extreme plantar breadth ...	90
Breadth index of head ...	79·4
Breadth index of Skull (approx.)	77·4
Nasal index: on face ...	87·7
Femur (R.), length ...	483
Tibia „ „	405
Fibula „ „	400

* These records are only approximative owing to the œdematous state of the body.

MEASUREMENTS ON THE CRANIUM BISECTED IN THE MESIAL SAGITTAL PLANE.

THE anatomical and zoological departments contain a number of crania of man and other mammals, which have been mesially bisected. Such preparations afford opportunities for demonstrating the peculiar morphological features of the human cranium, and further enable comparisons to be drawn to some extent between crania of various

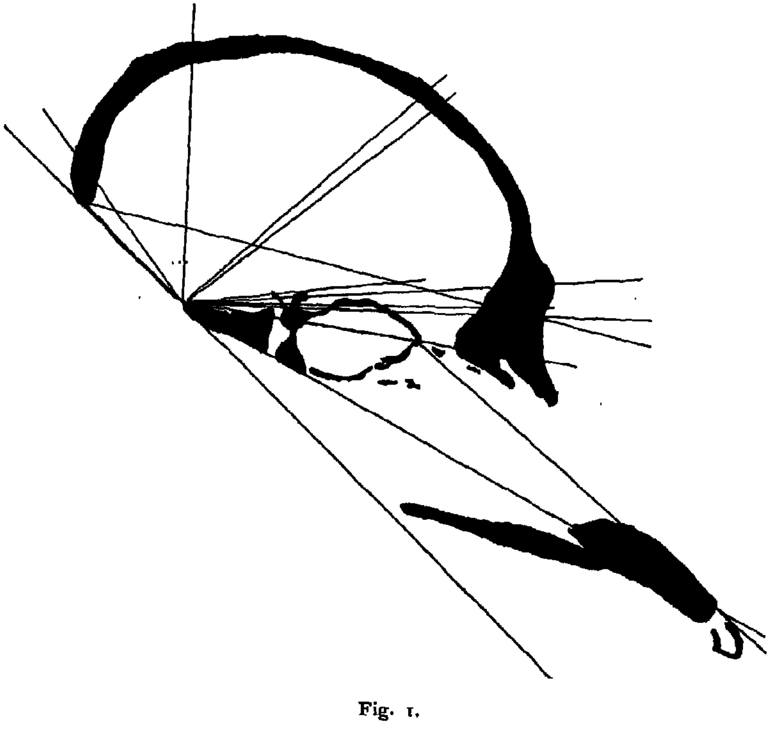


Fig. 1.

human races. With a view to giving some illustrations of the morphological differences in question, a number of linear and angular measurements have been made (cf. Fig. 1), and they are set forth in the appended tables A—D. The following notes deal with the main results provided by those figures.

The measurements (Table A) include data collected from Turner's monograph on Human Crania in the *Challenger Reports* (skulls marked "T"), with those provided by Brough-Smyth's (*Aborigines of Victoria*) drawing of the bisected cranium of an aboriginal of Australia. The remaining specimens are in the Anatomical Museums at Cambridge. The skulls marked "Eu." are European, and those marked "Au." are of aboriginal natives of Australia.

A review of the figures recorded in the Table (A), shows that the characters they represent are of value in distinguishing Man from Apes and lower animals rather than as a means of differentiation of the several human races. This remark is perhaps specially applicable to the angular measurements. In regard to the spheno-ethmoidal angle (which is so to speak intermediate between the sphenoidal angle of Ecker, and the angle of Landzert), the gradual decrease in the numerical value of the angle from the lower mammals to Man, gives a good indication of the gradual increase in the development of the frontal lobes of the brain which characterizes the Hominidæ.

The foramino-basal and foramino-sellar angles, small in the lower forms, increase in the Simiidæ and Man. This change represents the phases in the evolution of the human foramen magnum in relation to the cranial base.

The spheno-maxillary angle is greater in aborigines of Australia than in the white races and gives an expression of the degree of prognathism. It is to be preferred to the facial angles determined on the exterior of the cranium.

The changes in the position of the "perpendicular radius," with respect to the bregma, correspond in a general way with changes in mass of the frontal cerebral lobes.

In Table B, the dimensions of the frontal, parietal, and occipital arcs and chords are set forth; in all cases the occipital region is most curved, the parietal region least, the frontal region being intermediate between these extremes. But the aborigines of Australia do not in this respect provide strong contrasts with the white races.

Table C contains records of the values of the occipital angles of Broca as measured in various crania. The gradual change in the position of the foramen magnum in the evolution of the human cranial form from that of lower mammals, is well shown.

TABLE A.

Measurement	Eu. No. 1	Eu. No. 2	(2118) Au. ♂	(2127) Au. ♂	(T.) Au. ♂	(T.) Au. ♂	(T.) Au. ♀	(2116) Au. ♂	Au. ♂ (King Jimmy)	Chim-panzee	Orang-utan	Gorilla	Baboon	Ma-cacus	Cercop.	Dog
Basi-occipital radius	107	102	100	101	113	104	105	107	102	52	53	98	51	43	40	48
Basi-lambdoidal radius	102	115	109	111	115	110	111	121	130	68	76	92	57	50	44	61
Perpendicular radius	137	136	131	123	132	128	126	141	148	82	94	105	84	65	50	102
Basi-bregmatic radius	132	131	125	123	135	133	124	140	146	84	94	102	74	61	50	74
Basi-glabellar radius	111	110	114	105	108	114	101	109	126	75	99	140	93	68	59	96
Basi-nasal radius	96	99	101	99	97	102	95	100	112	67	99	120	85	67	59	102
Basi-alveolar radius	94	82	100	106	100	108	94	109	110	83	169	184	132	89	74	175
Most ant. point from perpend^r.	92	73	93	74	94	91	83	81	84	38	58	44	23	26	45	25
Most post. point from perpend^r.	81	92	74	85	73	72	82	90	82	51	53	69	51	41	31	39
Basi-occipito-sphenoidal axis	64	70	59	59	59	63	55	65?	68?	43	65	74	63	45	33	73
Cribriform axis	40	34	46	44	(34)	(28)	(28)	41?	48?	24	34	49	26	28	26	39
Spheno-ethmoidal angle	133°	144°	156°	150°	(136°)	(138°)	(138°)	144°?	150°?	168°	202°	158°	145°	141°	172°	231°
Foramino-sellar angle	128°	128°	136°	124°	129°	127°	124°	107°	123°	118°	127°	118°	90°	112°?	143°	104°
Foramino-basal angle	146°	153°	156°	137°	157°	150°	139°	137°?	141°	133°	142°	120°	103°	112°	143°	108°
Spheno-maxillary line	80	72	76	84	79	85	72	90?	88?	53	111	132	102	67	51	105
Spheno-maxillary angle	81°	70°	97°	94°	91°	93°	93°	88°?	90°	121°	146°	125°	104°	105°	119°	162°
Base-line. Nasion, Opisthion	123	128	137	129	130	136	127	132	142	89	130	140	92	80	73	104
Frontal chord	116	116	115	101	118	108	102	110	98?	67	68	92	66	62	53	52
Parietal chord	141	117	121	119	121	119	115	125	120	65	71	83	56	42	36	30
Occipital chord	81	98	99	86	99	81	87	99	114	48	56	69	43	55	36	47
Distance of perpendic^r. from bregma. *P.* = posterior; *A.* = anterior	37 *P.*	38 *P.*	26 *P.*	18 *P.*	26 *P.*	55 *P.*	44 *P.*	23 *P.*	50 *P.*	4 *A.*	5 *P.*	13 *A.*	31 *A.*	23 *A.*	0	50 *A.*

TABLE B. *Comparison of Chords and Arcs.*

Description of skull	Eu. No. 1	Eu. No. 2	Au. 2118	Au. 2127	Au. ♂ T.	Au. ♂ T.	Au. ♀ T.	Au. ♂ 2116
Frontal arc	135	130	134	115	143	130	122	125
Frontal chord	116	116	115	101	118	108	102	110
Parietal arc	149	131	131	132	137	125	128	134
Parietal chord	141	117	121	119	121	119	115	125
Occipital arc	109	125	112	112	121	119	110	117
Occipital chord	81	98	99	86	99	81	87	100

TABLE C. *Occipital angles of Broca.*

No. of skull	No. i.	No. ii.	No. of skull	No. i.	No. ii.
European, No. 1 ...	9°	12°	Orang	33°	46°
European, No. 2 ...	14°	19°	Gorilla	40°	49°
Australian, No. 2118 ...	9°	13°	Macacus (? Sp.) ...	41°	51°
Australian, No. 2116 ...	19°	24°	Cynocephalus babouin	57°	67°
Australian, King Jimmy	21°	27°	Cercopithecus (male) ...	29°	37°
Australian, No. 2127 ...	23°	30°	Horse (*Equus caballus*)	77°	86°
Young Chimpanzee ...	30°	43°	Dog (*Canis familiaris*)	78°	89°

No. i. Angle between Opisthio-nasal line and plane of Foramen Magnum.
No. ii. Angle between Basi-nasal line and plane of Foramen Magnum.

Table D gives measurements made upon the facsimiles of the preceding tracings with a view to investigating the extent of the endo-cranial cavity before and behind the perpendicular drawn from the central point of the "middle-cranial base," or line from the basion to the prosphenion (spheno-ethmoidal junction) (cf. Fig. 13). But the variations seem to be too wide to provide any grounds for a general statement.

The tracings reproduced in illustration of the foregoing observations are as follows:

Fig. 1, Orang-utan; Fig. 2, European No. 1; Fig. 3, European No. 2; Fig. 4, Australian 2116; Fig. 5, Australian 2118; Fig. 6, Australian 2127; Fig. 7, Chimpanzee; Fig. 8, Gorilla; Fig. 9, Baboon; Fig. 10, Macacus; Fig. 11, Cercopithecus; Fig. 12, Dog; Fig. 13, Orang-utan.

TABLE D.

	Eu. No. 1	Eu. No 2	♂ Au. 2118	♂ Au. 2127	T. Au. ♂	T. Au. ♂	T. Au. ♀	King Jimmy	Chimpanzee	Orang	Gorilla	Baboon	Macacus	Dog
Length of "perpendicular"	121	130	125	120	118	126	116	136	70	81	86	59	53	54
Distance of Bregma from "perpendicular"	76 post.	61 post.	65 post.	75 post.	74 post.	78 post.	82 post.	98 post.	37 post.	33 post.	60 post.	29 post.	26 post.	17 post.
Distance of most anterior point on the endo-cranial surface, from the "perpendicular"	85	76	81	70	82	86	85	84	50	55	64	48	42	56
Distance of most posterior endo-cranial point from the "perpendicular"	75	87	78	77	70	72	66	80	43	60	52	38	28	23

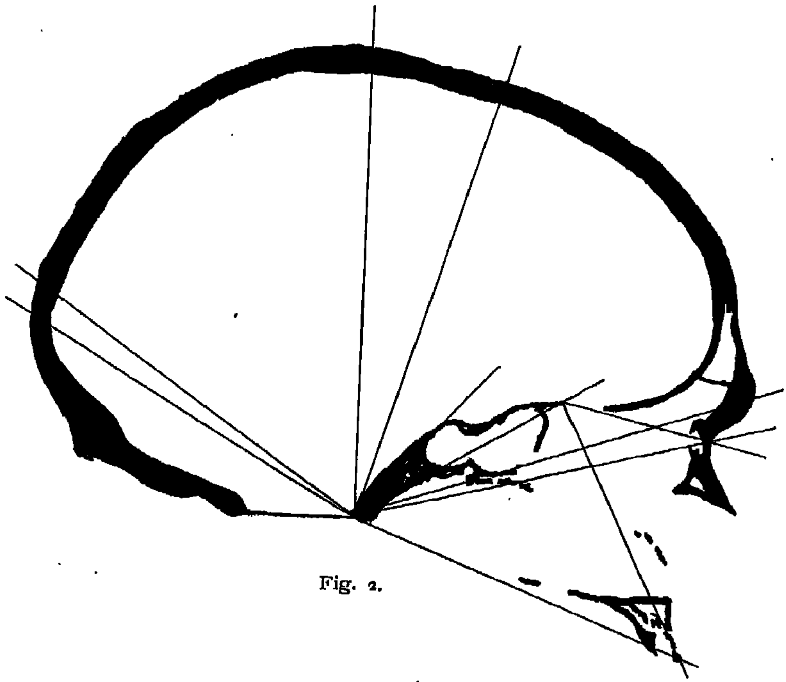
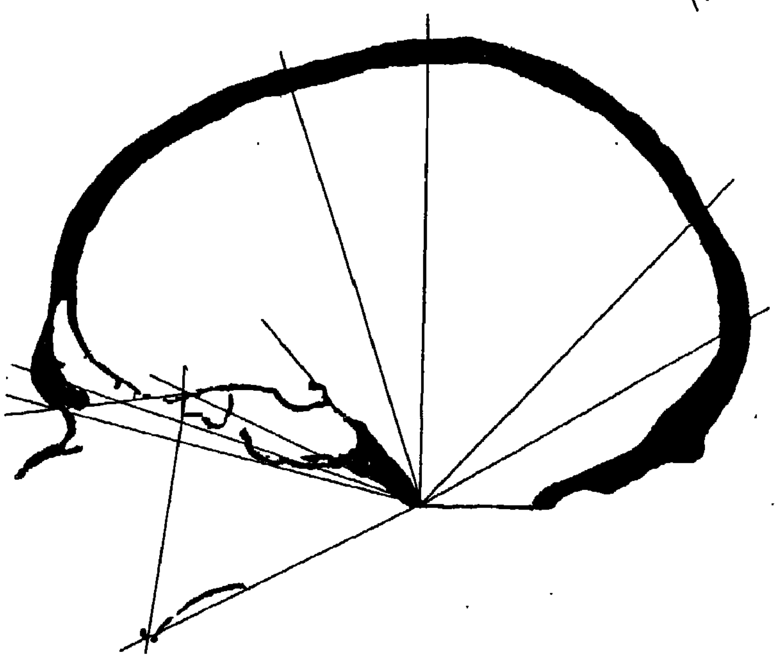


Fig. 2.



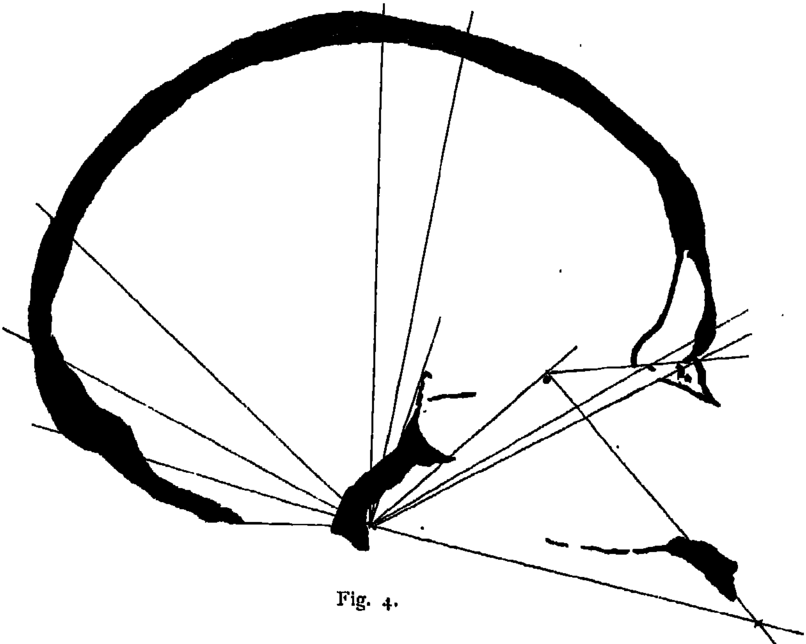


Fig. 4.

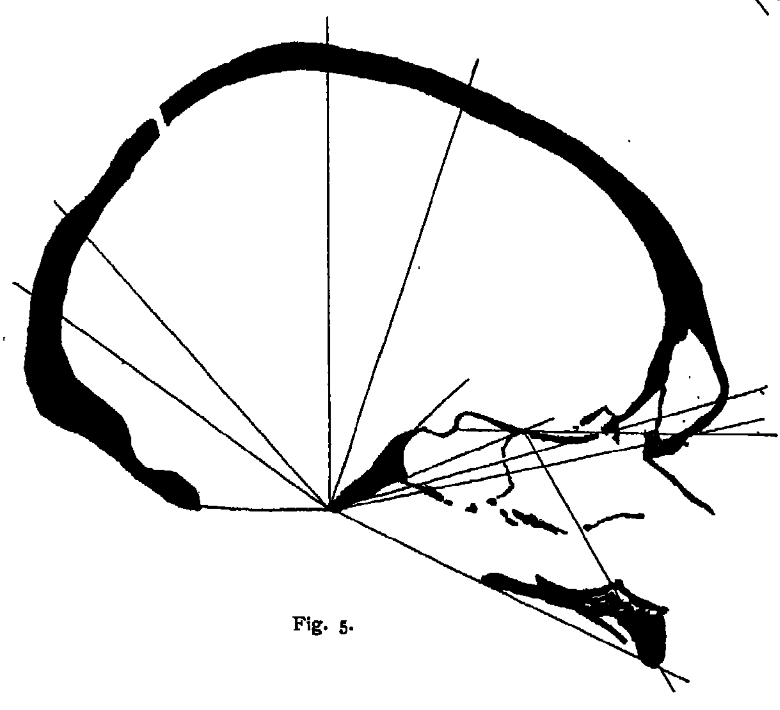


Fig. 5.

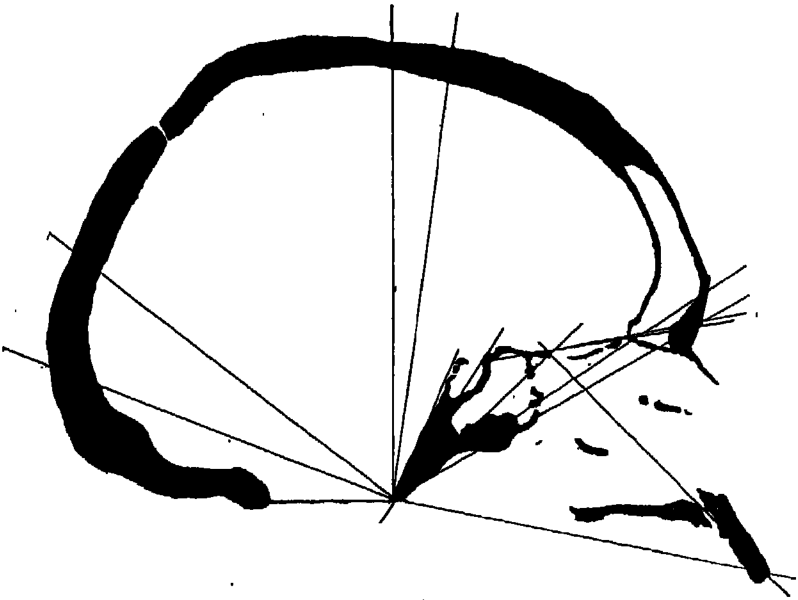


Fig. 6.

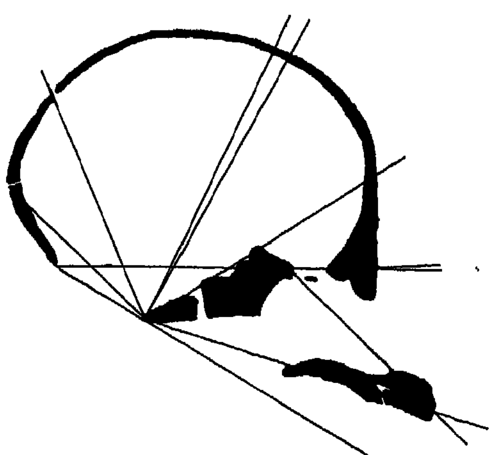


Fig. 7.

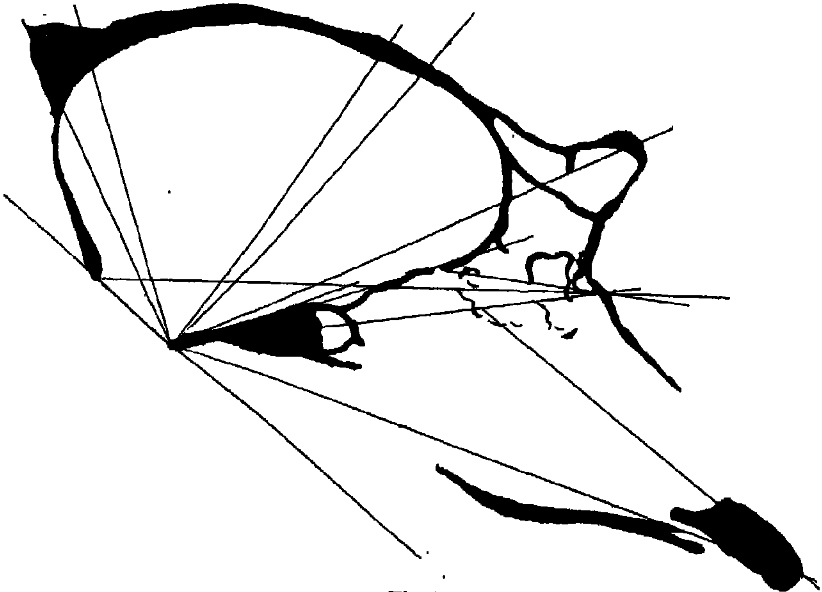


Fig. 8.

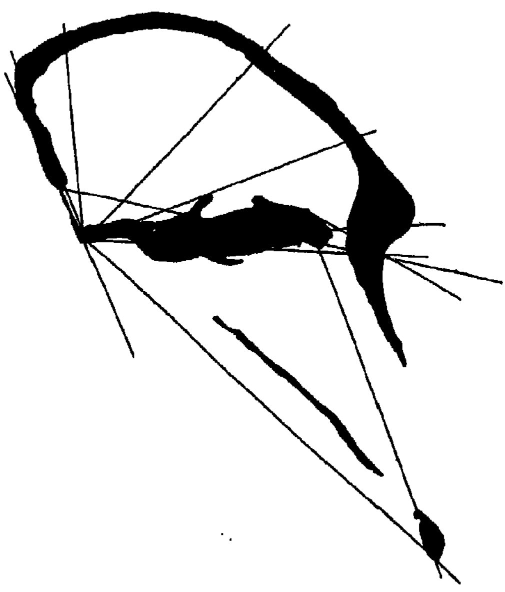


Fig. 9.

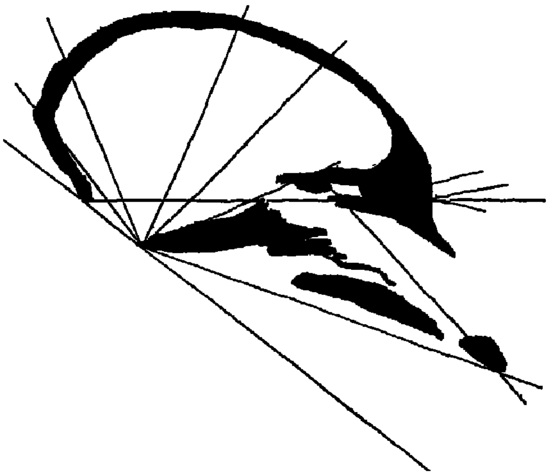


Fig. 10.

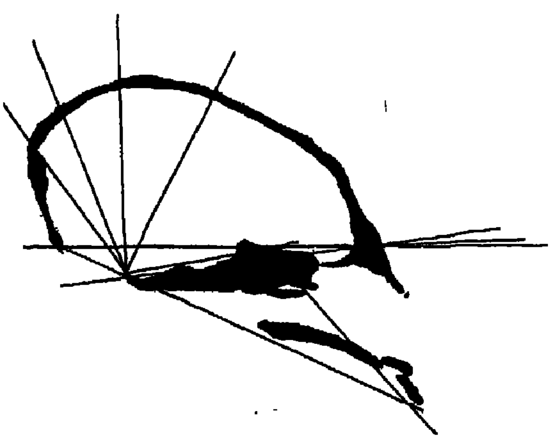


Fig. 11.

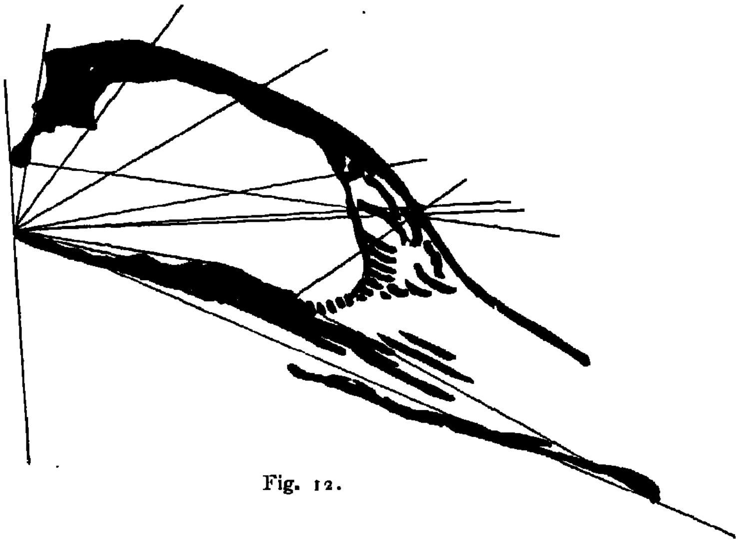


Fig. 12.

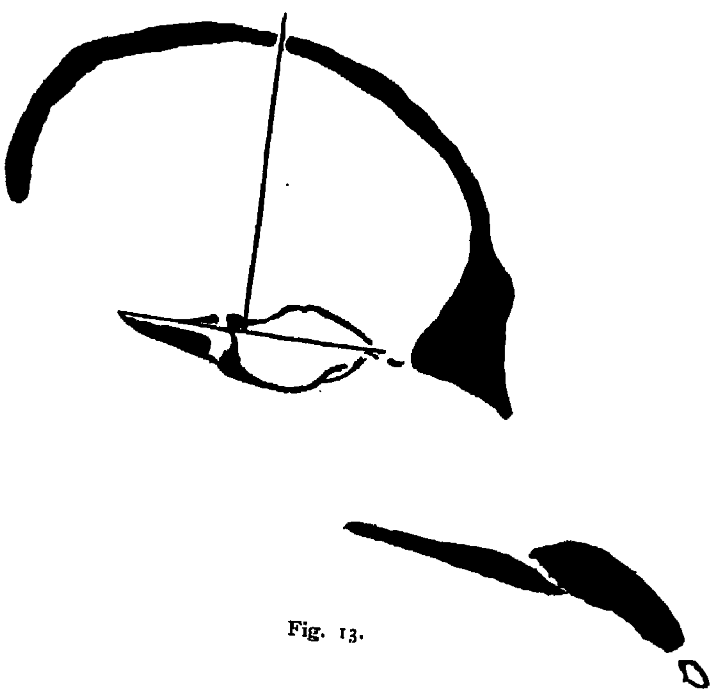


Fig. 13.

DISSECTIONS OF THE UPPER LIMB OF GORILLA, HYLOBATES AND CYNOCEPHALUS.

A number of apes are being dissected in the Anthropological Laboratory, and the following notes deal with some of the more interesting regions hitherto examined. The specimens include examples of the Lemuroidea and Anthropoidea as will be observed from the names appended to the descriptions of the structures dissected.

The posterior interosseous nerve.

The distribution of this nerve attracts a considerable amount of attention, in view of the record (made by Hepburn) of its contributing a branch to penetrate the interosseous membrane and supply the M. pronator quadratus in Hylobates. With the object of investigating the frequency of this anomaly (for such it must be considered) a young Gorilla (Mus. Cant. "Lag. 3") and a young Cynocephalus mormon were examined. The following notes refer to the general relations of the nerve in the Gorilla (Fig. 1).

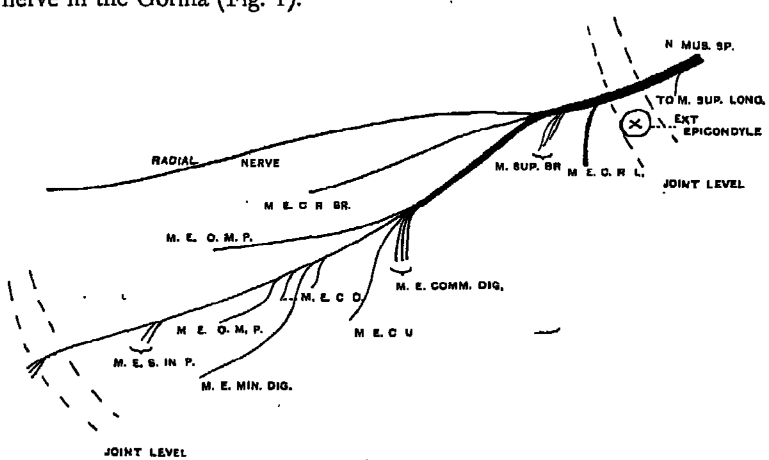


Fig. 1.

The musculo-spiral nerve was not found in the external bicipital groove: here the M. supinator longus is fused with the M. brachialis anticus (and also with the M. triceps): an incision having been made into the substance of the M. supinator longus near its junction with the M. triceps, the musculo-spiral nerve is exposed running deeply to the former muscle.

The musculo-spiral nerve is then found to divide as in Man (the MM. supinator longus and extensor carpi radialis longior had to be separated artificially at their common origin); just before division, it supplies twigs to the M. supinator longus, to the M. extensor carpi radialis longior and to the M. supinator brevis (see scheme). The radial division also supplies the M. supinator longus on its deep surface, passes outwards beneath that muscle and becoming superficial in position, supplies fibres to the adjacent surfaces of 2½ digits on their dorsal aspect.

The posterior interosseous division is deeply placed, the great extent to which the muscles are fused rendering its exposure dependent on the removal of muscular tissue. It crosses the M. extensor communis digitorum obliquely, passes deeply to the M. extensor secundi internodii pollicis, under the tendon of which it terminates. Its branches of supply do not include a perforating twig to the M. pronator quadratus, and it ends terminally in the loose connective tissue over the posterior carpal ligament. The appended scheme (Fig. 1) shows the several branches dissected out.

In the cynocephalous monkey (Fig. 2) the conditions are very similar: a slight difference is noted in the order in which branches are supplied to the extensors, but no perforating branch could be discovered. The second figure shows the distribution of the nerve.

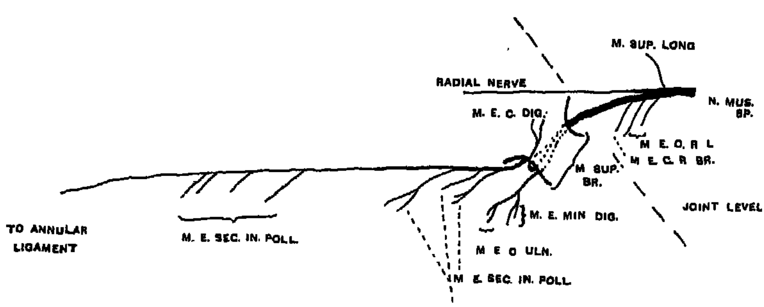


Fig. 2.

From these two dissections, the conclusion that the perforating terminal branch described in Hylobates by Hepburn is anomalous and not a constant feature, must be regarded as corroborated.

Extensor musculature of the fore-arm.

The following descriptions are drawn from dissections of several members of the Primates carried out in the Anthropological Laboratory.

A. Deep Extensors.

M. extensor ossis metacarpi pollicis.

Nycticebus (Lemuroidea). The muscle is present and resembles that of Man, but there is no carpal insertion.

Hapale jacchus (Anthropoidea, Hapalidæ). The muscle is represented by the portion which is carpal in Man, not by its metacarpal component. This carpal extensor has a common origin with the M. extensor indicis.

Cynocephalus mormon (Anthropoidea, Cercopithecidæ). The muscle consists of three distinct portions, one of which is metacarpal, the other two being carpal to the trapezium. A tendon crosses all the other intervening extensor tendons, to reach the M. extensor ossis metacarpi pollicis from the tendon of the M. extensor indicis.

Hylobates mulleri ♀ (Anthropoidea, Simiidæ). The muscle arises (much as in Man) from radius, ulna, and interosseous membrane.

Gorilla savagii (♂ "Lag. 3" Anthropoidea, Simiidæ). The muscle arises distally on the radius, ulna, and interosseous membrane, and divides distally into carpal and metacarpal portions. From the metacarpal portion, a tendinous slip runs on to the first phalanx. The muscular tissue descends far on the tendons.

M. extensor primi internodii pollicis (Extensor pollicis minor).

Nycticebus: the muscle is absent.

Hapale: the muscle is derived from the M. extensor indicis.

Cynocephalus: the muscle is absent.

Hylobates: the muscle resembles the M. ext. oss. met. pollicis in possessing origins from the radius, the ulna and the interosseous membrane. As in Man, the attachments are distal to those of the M. ext. oss. met. pollicis.

Gorilla (Lag. 3): the tendon arises from that of the M. ext. oss. met. pollicis.

M. carpi radialis longior and brevior.

Hapale: both muscles are present in similar situations to those occupied by them in Man.

Cynocephalus: the muscles have a common origin, from the external epicondyle with the M. ext. comm. digitorum, and ext. min. digiti.

Hylobates: the M. extensor longus comes from the outer supracondylar line and is distinct from the shorter muscle which comes from the condyle itself.

Gorilla: the muscles originate as in Man: at their origins they are closely connected: to a distance of about 60 mm. below the external epicondyle they take fleshy origin from the intermuscular septum between them and the M. ext. comm. digitorum. Passing downwards the tendons are closely attached to one another till they pass beneath the tendon of the M. ext. oss. metacarpi pollicis. Below this they are separable and attached to the bases of the metacarpal bones II and III much as in Man.

M. extensor secundi internodii pollicis:

Nycticebus: the muscle is distinct from the M. ext. indicis.

Cynocephalus: the muscle is present and distinct.

M. extensor communis digitorum.

Hapale: the muscle tendons are united by an aponeurosis over the dorsal carpal surface.

Cynocephalus: a slender muscle arises by a common origin from the extensor aponeurosis of the forearm, with the M. extensores carpi radiales longior and brevior and minimi digiti. It is inserted into the index, third, fourth and fifth digits and between the tendons a membrane is stretched.

Hylobates: in the forearm there is a partial origin from the intermuscular septa and adjacent muscle sheaths. On the back of the hand the tendons spread out and are connected by an aponeurotic membrane.

Gorilla: the muscle arises from both forearm bones from the interosseous membrane from the intermuscular septum between it and the M. supinator brevis, upon the sheath of the latter muscle: the ulna slip is very deeply and very distally situated, proximally the attachment is traceable to the external epicondyle, the most proximal part of the origin being in common with the extensores carpi radiales and ulnaris.

M. supinator longus.

Gorilla: the muscle arises from the supracondylar line, and from the deep fascia overlying it: the insertion is into the base of the styloid process of the radius.

M. extensor indicis.

Hapale: the muscle gives off the M. ext. pr. inter. pollicis.

Cynocephalus: the muscle is independent and slender, arising from the ulna alone: it gives off a slip to join the tendon of the M. ext. oss. met. pollicis.

M. extensor digiti medii.

Cynocephalus: the muscle is separate and slender: it arises from the ulna below the M. ext. indicis.

M. extensor digiti medii et digiti annularis.

Hapale: the muscle is present.

Hylobates: the muscle arises from the ulna below the M. extensor secundi internodii pollicis, and spreads out in the hand into an aponeurosis resembling that of the M. extensor comm. digitorum.

M. extensor minimi digiti.

Hapale: the muscle is present; as in Man it is joined by a slip from the M. ext. comm. dig.

Cynocephalus: the muscle arises from the extensor aponeurosis and the intermuscular septum between it and the M. ext. comm. digitorum. It gives a slip to the *ring* finger.

Hylobates: two separate muscles: (1) from the M. ext. comm. digitorum a slip is given off to the little finger: (2) an accessory muscle which is partly blended with the M. ext. comm. digitorum and partly with the M. ext. carpi ulnaris.

M. extensor carpi ulnaris: present in all forms examined.

M. anconeus.

Hylobates: absent or blended with the M. ext. carpi ulnaris.

M. interosseus dorsalis primus.

Nycticebus: this muscle does not arise from the first metacarpal at all, but solely from the second metacarpal bone. This appearance is seen in the higher Primates also (cf. note by Dr St J. Brooks, *Journ. Anat. and Physiol.* vol. xxii. 1888, p. 92). In Nycticebus the radial artery is minimal in size and largely replaced by a median artery.

The Palmar fascia in Gorilla (Lag. 3), left upper extremity.

There is no M. palmaris, the deep fascia over the flexor aspect of the forearm is thick and increases in density and thickness as the carpus is approached: over the anterior annular ligament it attains thickness of 2 mm. (the fibres being mainly transverse in direction) and passes distally to form the palmar fascia. Still more distally, fewer transverse and more longitudinal fibres are encountered and more fat is seen. No M. palmaris brevis occurs.

Finally about 5 mm. above the distal ends of the metacarpal bones, the fascia splits into four portions each running distally along the line of the digits and wrapped round the tendon sheaths, being attached on either side to these, and to the metacarpals. Between the latter, the

fascia is attenuated, to form a slight covering for the interdigital vessels and nerve. Radialwards, the fascia blends with that over the M. abductor indicis and the thenar muscles, ulnawards it blends similarly with the fascia covering the muscles of the hypothenar group.

The polliceal musculature.

M. flexor longus pollicis.

Nycticebus (tardigradus): the muscle is distinct: its tendon is joined by a slip from the common deep flexor muscle.

Cynocephalus: there is no separate long flexor muscle; the M. flexor digitorum profundus provides a slip for the pollex.

Gorilla (Lag. 3): there is no separate long flexor muscle of the pollex.

The following table gives the results of dissection in Cynocephalus mormon of the short muscles of the pollex.

Muscle	Origin	Insertion
1. M. abductor pollicis.	The anterior annular ligament.	The base of the proximal phalanx of the pollex.
2. M. opponens pollicis (a well developed muscle).	The anterior annular ligament.	The shaft of the first metacarpal bone.
3. M. flexor brevis pollicis:		
A. "radial" part.	The anterior annular ligament.	The base of the proximal phalanx of the pollex; to the ulnar side of the insertion of the M. abductor pollicis.
B. "deep" or "ulnar" part.	Apparent origin from the trapezium and trapezoid.	The base of the proximal phalanx of the pollex.
4. M. adductor obliquus pollicis.	Apparent origin from trapezium and trapezoid.	The base of the proximal phalanx of the pollex, to the ulnar side of the M. flexor brevis pollicis.
5. M. adductor transversus pollicis.	The shaft of the third metacarpal bone.	Along the ulnar side of the proximal phalanx of the pollex and extending to the base of the distal phalanx. Cf. Gorilla.

The polliceal musculature in Gorilla.

The M. adductor transversus pollicis runs for a considerable distance along the proximal phalanx of the pollex, and almost reaches the distal phalanx, as in Cynocephalus (*v.* supra). A similar condition is reported by Brooks (*Journ. Anat. and Physiol.* vol. xxii. 1888, p. 87), in the manus of Hylobates and in the pes of Hylobates, Simia, and Anthropopithecus niger.

A comparison of the polliceal musculature in three examples of the Simiidæ (viz. Hylobates, Simia, and A. niger), gave the following results.

	Anthropopithecus niger (Chimpanzee)	Simia (Orang-utan)	Hylobates (Gibbon)
1. General arrangement.	Most human.	Less human.	Least human.
2. M. opponens pollicis.	As in Man.	Feebler than in Man.	As in Man with the addition of an accessory M. adductor opponens.
3. M. flexor brevis pollicis:			
(A) radial portion.	As in Man.	As in Man.	As in Man.
(B) ulnar portion.	Fibrous band: & so more reduced than in Man.	Larger than in Man.	Larger than in Simia or Man.
4. M. adductor obliquus pollicis.	?	?	Tendency to extension to ungual phalanx.
5. M. adductor transversus pollicis.	Takes origin from the shaft of the third metacarpal bone.	Takes origin from the shaft of the third metacarpal bone.	Takes origin from the proximal half of the shaft of the third metacarpal bone. It tends as in Gorilla and Cynocephalus to be inserted into the ungual as well as the proximal phalanx of the pollex.
6. M. slip from the M. adductor obliquus *or* transversus, to the first metacarpal bone.	Infrequent.	Not uncommon.	Frequent, and described as M. adductor opponens pollicis.
7. M. slip from M. adductor obliquus pollicis to the radial sesamoid bone.	Infrequent.	Infrequent.	Infrequent.

The hypothenar musculature in Gorilla (Lag. 3, Mus. Cant.).

M. abductor minimi digiti:

Origin. (α) from the pisiform bone and adjacent ligaments.

(β) from the ulnar side of the fifth metacarpal bone.

Insertion. The base of the proximal phalanx of the little finger.

M. flexor brevis minimi digiti.

Origin. The unciform process.

Insertion. With the preceding muscle.

M. opponens minimi digiti is also present.

These muscles lie superficial to the denser part of the palmar fascia, which passes deeply to them, blending with their sheaths and is lost at the shaft of the fifth metacarpal bone.

A CRITICAL STUDY OF THE COLLECTION OF CRANIA OF ABORIGINAL AUSTRALIANS IN THE CAMBRIDGE UNIVERSITY MUSEUM.

Material. The number of crania is, in all, thirty-eight, and of these, twenty-nine are crania of adults, five of aged persons, and four of youths.

Sex. Of the adults, five are females and twenty-four are males. The five aged are all males. Of the four young skulls, two belonged to youths of about eighteen to twenty years of age, one a child of seven or eight, and one a young female of about twelve or thirteen years.

Geographical Classification. Ten specimens are from South Australia, and with ten skulls of "Murray" natives, form a group of twenty South Australians.

Six specimens are from New South Wales and four from Victoria, two from Western Australia, one from the Northern Territory of South Australia, and one from Melbourne (but the exact locality whence the last was obtained is not recorded).

Of the source of four specimens, three of which accompany complete skeletons, there is no record.

State of Preservation. The state of preservation varies widely, as may be gathered from the tables of measurement, and from the detailed descriptions of the individual specimens.

INTRODUCTORY FOOTNOTE.

A description of these skulls was commenced by Prof. Macalister, and the present writer has had the benefit of Prof. Macalister's notes and measurements. The notes have been incorporated in the craniological part, and the measurements were revised and added to in the craniometrical part of the present work, which is thus an extension of that begun by Prof. Macalister.

Plan of work.

Measurements were made and tabulated.

A carefully detailed description of each specimen has been written, describing the age, sex, state of preservation and appearances presented in the several *normae*: individual peculiarities were recorded. This series of descriptions follows the numerical order of the Cambridge catalogue, without regard to the grouping of the crania according to districts or tribes.

Tables I and III.

i. *Discussion of the measurements.* These, which number about forty-six, are arranged in a table of general measurements, and the corresponding averages are arranged in another table.

Tables II and IV.

ii. For skulls upon which all the above measurements could be made, a series of thirteen indices has been made out, the number of indices varying for skulls which are not complete: the averages of these indices are arranged in a separate table.

Tables V, VI, VII.

iii. Tables of additional measurements are three in number, and comprise:

(α) Measurements of the mandible.
(β) Miscellaneous: lengths of sutures, &c.
(γ) Dimensions of teeth (two tables).

And for these the averages are arranged in the respective tables.

Tables VIII and VIII a.

iv. Special tables present the measurements of certain groups of crania, viz., all those of South Australians; all those from New South Wales; and all those from Victoria. In these tables the indices and a limited number only of measurements will be found.

Table IX.

v. The method of seriation has been applied to the whole series of indices and to the indices of the group of South Australians. Also to a few of the principal measurements of the same.

Table X.

vi. All the averages of the measurements made have been reduced to the figures which present their relationships to the average basi-nasal length taken as 100. (This of course has already been done for the basi-alveolar length in calculating the alveolar index of the averages.) This table is divided into four columns which correspond to the four columns of the table of averages (Table III). In a subsidiary table are appended the corresponding values as calculated for series of (1) Andamanese Islanders; (2) Fijians; (3) Islanders from Torres Straits; these are taken from Sir William Flower's memoirs in the *Journal of the Anthropological Institute.*

Table XI.

vii. The frequency of the occurrence of a certain number of characters such as the epipteric bone, third condyle, &c., was observed, and the results have been tabulated.

Table XII.

viii. All the available figures representing the average cubic capacity, cephalic and other indices, have been brought together into one table, so that for instance the average cubic capacity is calculated from 150 cases. The authors whose memoirs have been referred to in this connection are—

Dr Barnard Davis (*Thesaurus Craniorum*).
Sir William Flower (*Journ. Anth. Inst.* and *Cat. Roy. Coll. Surgeons*).
Sir William Turner ("Challenger" Report).
MM. Quatrefages et Hamy (*Crania Ethnica*).
M. Cauvin (*Bull. Soc. d'Anth. de Paris*, 1883).

Table XIII.

ix. Is an additional table, which is really a seriation, and as such will be discussed with the other seriations of Table IX.

Two skulls have been longitudinally bisected: measurements made on "rubbings" of these have been tabulated with the corresponding measurements made on rubbings of similarly bisected skulls of anthropoid apes and other animals. In the same table are the corresponding measurements made by Sir William Turner on similarly treated skulls of Australians [cf. pp. 80 *et seq.*].

The skulls of three adult and one aged males present considerable

divergences from the usual type. They will be referred to as "doubtful" skulls and the averages of the male skulls, *without* these four "doubtful" skulls, have been arranged in a special column throughout the tables.

Descriptive part. The work has been resolved into a series of descriptions (craniological) accompanied by measurements (craniometrical part). Besides the detailed descriptions, as yet unpublished, a series of short notes have been written, describing individual peculiarities. From the whole series of descriptions, that of the typical skull has been deduced, and this differs in no important respect from those already published.

Measurements : Explanatory details. Measurements were made with a craniometer (Flower's) graduated in millimetres, and with a steel tape; and the cranial capacities were estimated by using No. 8 shot, which was arranged by shaking the skull and occasional use of a wooden rammer. The mean of two observations for each specimen, not differing by more than 10 c.c., has been recorded: exceptions to this rule must be made with regard to very imperfect skulls.

Other measurements were made according to Flower's instructions. The jugo-nasal breadth and arc are measured according to the directions of Oldfield Thomas in the *Journ. of the Anth. Institute*, vol. xiv. p. 333. The anterior palatine breadth is that between the roots of the canine and first premolar teeth; the posterior palatine breadth that between the first and second molar teeth. The horizontal circumference did not include the greatest prominence of the glabella.

Discussion of the tables. Looking over the facts presented by the various tables, in Table I it may be noticed that the average cranial capacity of twenty-six specimens of both sexes is 1252 c.c. The average capacity of the male skulls is 1269·9 or 1235, according as the four doubtful skulls are included or not. These values accord fairly well with those recorded for other series (by Turner, Flower, and others).

The maximum length exceeds the ophryo-occipital length by a good deal more in the males than in the females, and thus gives an indication of the greater and more frequent prominence of the glabella in the former sex.

The maximum breadth was usually on or about the parieto-squamous suture, but in one or two instances considerably below this.

The difference between the two sexes is clearly shown in the relative magnitudes of the bi-asterial and bi-stephanic breadths, for in the males the bi-asterial distinctly exceeds the bi-stephanic breadth, whereas in females the two are about equal, the bi-asterial breadth in females being smaller, rather than the bi-stephanic breadth being greater, than in males.

As regards the measurements indicating facial breadth (*i.e.*, the

external bi-orbital, bi-zygomatic, bi-malar and other breadths) the males exceed the females by very little, except in the case of the bi-zygomatic breadth; in this the difference between the sexes is pronounced, and is doubtless related to the greater mass of muscles working the lower jaw, and occupying the zygomatic fossa, of males. It must be admitted that this comparison is only drawn from *three* female skulls, but it is borne out by the dimensions of female skulls in other collections.

The bi-zygomatic, besides exceeding the other measurements of facial breadth, often nearly coincided with the maximum parieto-squamous breadth of adult males, but in the young skulls was much below that breadth. This again indicates the relative size of the masticating muscles in the two cases.

Height. The basi-bregmatic height, in most cases, is slightly smaller than the maximum parieto-squamous breadth. This will be referred to later in connection with the group of skulls from South Australia.

The palato-maxillary length is very great in several specimens; the mean value is considerably affected by the presence of the four "doubtful" skulls.

The comparative lengths of the frontal, parietal and occipital arcs respectively are of considerable interest in view of the generalisations of M. Cauvin on this subject. (*Bulletin de la Soc. d'Anth. de Paris*, 1883, p. 253.) This writer states that in the crania of Australians (and of Papuans and Melanesians) the parietal arc exceeds in length the frontal occipital arcs. In thirty-one specimens of both sexes described by Sir William Turner, the frontal and parietal arcs of eight (five males, three females) were almost equal in length; in twelve (eight males, four females), the frontal was in excess; in eleven (seven males, four females), the parietal was in excess of the frontal.

In the Cambridge collection, out of thirty-three skulls of both sexes, the frontal and parietal arcs of three (two males, one female) were of equal length; in fifteen cases (thirteen males, two females) the frontal exceeded the parietal; in fifteen cases (fourteen males, one female) the parietal exceeded the frontal arc.

Combining all these with the additional cases cited by Sir William Turner (in vol. ii. of his report) it appears that of sixty-nine skulls of adults of both sexes, the frontal and parietal arcs are of equal length in eleven cases, the frontal is in excess in twenty-nine cases, and the parietal arc is in excess in twenty-nine cases also.

With regard to the occipital arc: in thirty-four cases out of thirty-six recorded by Sir William Turner, the parietal arc exceeded the occipital; in the remaining two (a male and a female) the occipital arc exceeded the parietal.

Of thirty-one cases in the Cambridge Museum, the parietal was greater than the occipital in twenty-nine, less in two (both males). So that of sixty-seven cases the parietal arc exceeded the occipital in sixty-three. So that in this respect M. Cauvin's generalisation holds good.

But as regards the frontal and parietal arcs, it appears from a study of sixty-nine skulls of adults of both sexes from the Cambridge and Edinburgh collections, the two arcs are unequal nearly five times as often as not, and that when unequal the frontal arc is just as often the longer of the two as not. So that there is no confirmation of this part of M. Cauvin's statement.

Oblique parietal arc (*Macalister*). Mention must here be made of the measurement called by Professor Macalister the "Oblique Parietal Arc." Its plane lies in the general direction of the fissure of Rolando. The mean value in this series is remarkable as being nearly the same for both sexes. No other large series of this measurement are as yet on record, but the following may serve as examples met with in the Cambridge collection.

Australians	343 mm.	av. both sexes.
A Tasmanian ...	336 "	
N. A. Indians ...	365 "	av. of 3.
Negroes	368 "	av. of 5.
New Zealanders ...	368 "	av. of 3.
Ancient Peruvians ...	371 "	av. of 5.
Modern Europeans ...	370 "	av. of 2.
Kaffirs	375 "	av. of 5.
A Carib	375 "	
A Murray Islander ...	375 "	In the Liverpool Museum.
An Eskimo (male) ...	384 "	

Mandible. The mandible accompanies the cranium in eighteen specimens. The measurements show the excess of the average dimensions of the male over the female mandible. In both, the coronoid and condylar heights are nearly equal; in both, the intergonial exceeds the gonio-symphisial length, the excess being more pronounced in male jaws.

Average Indices. The average indices have been calculated in two ways and the results arranged in two tables (IV, and IV*a*), one containing the averages of the indices in distinction from the indices of the averages arranged in the other; the former, though less correct, has the advantage of admitting a greater number of instances, and the differences between the two tables will be found for the most part insignificant.

Breadth Index. The mean breadth index of thirty-eight specimens is 70·5; of twenty-nine males 70; of five adult females 72·9. Four specimens are above the upper limit of dolicho-cephalic skulls (three

males, one female); the highest individual index is 76·6, which with the second highest 76, belongs to "doubtful" skulls. Without the four doubtful specimens, the mean breadth index of twenty-five males is 69·2. The lowest index is 64·9, that of the cast of the skull of King Rufus Billy (a Murray native); though the exact state of the sutures of this scapho-cephalic specimen cannot be ascertained, the sagittal appears to be free from synostosis. The next lowest index is 65·9 (No. 2112, in which sagittal synostosis is nearly complete).

Vertical Index. The mean vertical index of thirty-four crania is 69·6; that of twenty-six males 69·8; that of three females 68·6. The mean height of twenty-five male skulls is 130·5 mm. and their mean breadth is 132 mm.; of four females the mean height is 121 mm., the mean breadth is 128 mm. Altogether the series of skulls is dolicho-platycephalic.

Gnathic Index. The mean gnathic index of twenty-nine skulls is 101·2, of twenty-two males 101·8, of three females 102·7. Here again the doubtful skulls disturb the average, for when excluded, it is found that the mean index of nineteen males is 102·15. The highest individual index is 108·7 (a South Australian male, No. 2115). From the averages, the whole series and the skulls of each sex fall within the mesognathous group.

Nasal Index. The mean nasal index of thirty-two skulls is 55·6, of twenty-six males 55·4, of two females 53·25. They fall within the platyrrhine group. The highest individual index is 65·1, and one of the "doubtful" skulls possesses the lowest nasal index of the series, viz., 47·4.

Orbital Index. The mean orbital index of thirty-one skulls is 82·6: that of twenty-four males 81·2; of three females 87·4; accordingly the males are microseme, the females mesoseme. One of the doubtful skulls has an index of 92·7: after exclusion of the four doubtful skulls the mean index for twenty males is 80·5.

Palato-Maxillary Index. The mean palato-maxillary index of twenty-nine skulls is 111·7; of twenty-two males 110·4; of three females 112·6. Among the males, in four cases a low palato-maxillary index is associated with a high degree of prognathism, the two most pronounced cases being

Skull	Palato-maxillary Index	Gnathic Index
No. 2115	101·5	108·7
" 2127	92·2	107·1

On the other hand the very dolichuranic skull No. 2140 with an index of 97 has a gnathic index of but 100.

Palate Length. It might be mentioned in this connection that the comparatively low palato-maxillary index in many Australian crania is due to excessive length rather than reduced breadth; but this palatine length is much increased in many cases by a large tuber maxillare; herein, it is thought, lies a difference between these crania and the dolichuranic crania of anthropoid apes; for in the latter (in the majority of instances, so far available) the maxillary tuberosity is frequently quite insignificant and does not add to the palatine length, so that in this respect the palate of anthropoid apes resembles that of the more highly civilised races of man rather than the aboriginal Australian.

Total Facial Index. The figures for the total facial index do not accord very well with those published by Dr Topinard (*El. d'Anth. Gén.*, p. 919), where 107·2 is given as the mean index of seven Australians. In the Cambridge collection the mean index of fourteen skulls is 95·4, of ten males 96·2, of two females 93·6; and in the whole series two males out of ten only have indices above 100. The general indication then is of a longer face than that of the Australians referred to by Topinard. For the superior facial index of Broca, nineteen skulls give an average of 73·4, thirteen males of 73·7, three females 74·1. Topinard, quoting Broca's figures, gives 69·7 as the mean of twenty-seven Australians. Sir William Turner's "Challenger" Report contains figures which give 65·1 as the mean index of twenty-eight skulls. Both these observations denote faces shorter than those of the skulls in the Cambridge collection. Sir William Turner's series contained only three skulls from South Australia, whereas the majority of the skulls here described are from that district, and none of these presents an index below 71.

Facial Indices. It might be supposed that this is a feature characteristic of skulls from South Australia, but it must be admitted that no great reliance can be placed on such an index as this, depending as it does on the position of the ophryon. The superior facial index of Kollmann avoids this difficulty, and it is interesting to find that here again the indices of the skulls at Cambridge indicate a longer face on the average than do the indices calculated from the data furnished by Sir William Turner in the memoir already referred to. (Thus, the mean index of twenty-one skulls is 51·7, of fifteen males 51·8, of two females 54. Turner's figures give 48·8 as the average of thirty-three skulls, of twenty-one males 48·6, of nine females 48·9. Again, the average index of eleven skulls from South Australia in the Cambridge collection is 52·2.) To sum up the facts presented by these facial indices. From three

facial indices evidence appears that the skulls in the Cambridge collection, in which South Australians predominate, have a proportionally longer face than those from other districts. The relation of this feature to prognathism cannot be overlooked, and perhaps the difference between the South Australians and other series may be too slight to warrant any conclusions being drawn; but the recurrence of the same difference in three indices respectively is remarkable.

The average stephano-zygomatic index (of Topinard) indicates that the skulls are highly phænozygous, the males more so than the females. (Average index of twenty-one skulls is 79·9, of fifteen males 76·5, of three females 81·9.) The mean gonio-zygomatic index of fifteen skulls is 72·9, which agrees fairly well with the figure quoted by Topinard, viz., 75·5 as the average of four Australians.

Naso-Malar Index. The naso-malar index is of considerable interest owing to the small range of variation throughout this series. The range through twenty-seven skulls is less than 7 units (the range of the cephalic index through twenty-nine males being nearly 12 units). The average index of thirty skulls is 111·4, of twenty-three males 111·2, of three females 110·4. In his paper in the *Journal of the Anthropological Institute*, vol. xiv. p. 333, Oldfield Thomas gives 111·1 as the mean index of sixteen Europeans. One would expect the average value for the modern European skull to be somewhat greater than this, or else that of the aboriginal Australian to be somewhat lower.

Dental Index. The mean dental index of thirteen skulls is 45·2, of eight males (excluding the doubtful ones) 45·8, of two females 49·25. The fact of the female sex possessing the higher index agrees with the figures recorded by Sir William Flower, viz., 44·8 as the average of twenty-two males, 46·1 the average of fourteen females. The relatively smaller basi-nasal length in the latter sex probably is the cause of this apparent discrepancy.

Table VI.

Of the tables of additional measurements but little can be said at present. With regard to the dimensions of the posterior nares, it may be remarked that while the breadths are nearly equal, the height is only one-half that of the apertura pyriformis of the nose.

The average least distance of the temporal crests is 87·5 mm. (for twenty-two males), and in three females they did not approach nearer than 106 mm.

Teeth. As regards the dimensions of the teeth, the combined lengths of the lower molars exceed those of the upper set, and the same relation holds good for the combined lengths of molars and premolars. This

confirms the statements of Professor Turner in the *Journal of Anatomy and Physiology*, vol. xxv. p. 461. With regard to other statements in the same paper, viz. those referring to the apposition of the teeth, the confirmation is not so clear. Professor Turner makes the statement concerning a skull from South Australia, that the two sets of teeth are in contact by their cutting edges "when the condyles of the lower jaw were articulated, and placed in contact with the ridge that bounded the back of the glenoid fossa, and the teeth clenched."

The following specimens at Cambridge were available for examination with regard to this point, and the following notes present the results of such an investigation:—

No. 2101. South Australia (a cast and not the original skull).

When the condyles rest in the glenoid fossa no such apposition as was described is observed; on placing the mandible in such a position that apposition occurs, it is found that the condyle is resting on the rounded *anterior* border of the glenoid fossa formed by the anterior root of the zygoma. This might well be the position in life, as room would be afforded for the interarticular cartilage.

No. 2115. South Australia, male.

The lateral superior and two left lower incisors only persist. On placing the jaw in the desired position firmly, the condyles are found *not* to be in contact with any part of the floor or boundaries of the glenoid fossa, being separated by an interval of less than 1 mm., which was presumably occupied by the interarticular cartilage.

No. 2128. South Australia, male.

Arrangement very similar to No. 2115, but the right condyle just touches the anterior border of its glenoid cavity.

No. 2137. When the mandible is placed in the position in which the incisors bite surface to surface, a considerable area of the condyles is found to touch the glenoid fossa. It is here to be remarked that the glenoid fossæ of this specimen are very shallow and flattened, the flattening being most pronounced in the region of the anterior border of the cavity, so that the anterior root of the zygoma is indistinct. It is submitted that such a shallow glenoid fossa is an approach to a state that is usual in anthropoid apes. (Among Australian crania Nos. 2138, 2139, and 2140, exhibit the same feature in a less marked degree.) But even here the condyles are not touching the back of the glenoid fossa when the teeth are in apposition.

No. 2138 approaches most nearly to the state of affairs described by Sir William Turner. Dental apposition still occurs when the condyles are in the posterior part of the glenoid fossa.

Nos. 2139 and 2140 give no very definite evidence, but it seems

as if the condyle must occupy an *anterior* position in the glenoid fossa *in order that the teeth may be in apposition.* The influence of the size of the interarticular cartilage in determining this position has been hinted at by Topinard (*L'Anthropologie*, 1892). With regard to the occurrence of this apposition of incisors in races other than Australian, Sir William Turner remarks that he had observed it in a Malay, a Bushman and an Eskimo, while in 1860 Sir John Lubbock wrote in an account of the Danish kitchen-middens (in the *Natural History Review*), "the tumuli have supplied us with many skeletons of this period. ....one curious peculiarity is that their front teeth did not overlap as ours do, but met one another, as do those of the Greenlanders at the present day. This evidently indicates a peculiar manner of eating."

Further with regard to the occurrence in prognathic or orthognathic skulls, it may be mentioned that the same arrangement was observed in a very orthognathic skull dug up at Chester. It must be added that this specimen gave signs of deformation (though not posthumous) which may be responsible for the appearance of orthognathism.

The group from South Australia. Table VIII contains the indices and a few of the principal measurements of the group of skulls from South Australia, which form so large a proportion of the Cambridge collection. The chief point of interest is in the relative magnitudes of the cephalic and altitudinal indices. Considering averages, the breadth index is 70·2; the height index 68·9; the average skull is therefore dolicho-platycephalic. As regards the sexes, the mean breadth index of fifteen males is 69·6, the mean height index of twelve males is 69·15 (no appreciable difference); the three females, however, have a breadth index of 71·4 and a mean height index of 65·2, and so are very dolicho-platycephalic. Regarding now individual indices, the results as regards the males are different. In thirteen cases out of seventeen, the height index was less than the breadth index (of these nine were males, three females, one a youth). Sir William Turner says that of twenty-two crania from South Australia which he examined, seventeen had a lower height index than breadth index. This is exactly the same proportion as in the Cambridge collection. Combining the two sets of data, from a total of thirty-nine crania from South Australia, thirty are dolicho-platycephalic (nineteen males, ten females, and a youth); in two, the two indices are equal; in seven males the height index exceeds the breadth index.

As regards other indices, the gnathic is somewhat higher in this group than in the whole series, and the facial indices, as has been said, show a longer face to exist in this collection than in the skulls from

other districts. With regard to the frontal, parietal and occipital arcs, their relative lengths are much the same as in the whole series. (Combining the measurements given by Sir William Turner of South Australian skulls, with those in this collection, it appears that of twenty-three skulls, in three the frontal and parietal arcs are equal, in nine the parietal arc is the greater, in eleven the frontal, the occipital exceeding the parietal in two cases, and the frontal in one.) From this review of the features of crania from South Australia it must be admitted that no other striking feature other than the occurrence of dolicho-platycephalic skulls distinguishes them from aborigines from other districts. At the same time there is a slight difference in their facial indices, which may also prove distinctive.

Groups from New South Wales and Victoria. The Table VIII*a* refers to the measurements of the groups of skulls from New South Wales and Victoria respectively; they do not contain sufficiently large numbers to justify any general conclusions.

Seriations. Table IX. The method of seriation of characters has been applied in many cases without modifying the value of the averages as already calculated. There is, however, one notable exception, viz. the vertical or height index of the group of crania from South Australia. By examining the factors of this index, the basi-bregmatic height was found to be the disturbing element, and in consequence its seriation was carefully studied, figures relating to twelve well-authenticated male skulls being used. (Average height = 129·25 mm.) In forming a seriation with 5 units as its modulus, it was found that the crania fall into two groups almost symmetrically arranged with regard to the average figure, the groups being characterised by basi-bregmatic heights greater or less than about 129 mm. respectively.

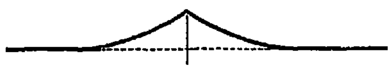
The small number of skulls renders this statement somewhat unimportant. By collecting all available data, the total number of adult male South Australian skulls was raised to twenty-four; and in a similar seriation the same grouping is again observed, while it is much more marked when the modulus is 2 units (the diminution in this respect being justified by the increased number of specimens under consideration).

It may be urged that the choice of the modulus (2 or 5) whereby these features were brought out, was quite arbitrary, and this indeed is the case. It seemed then that a modulus of a different dimension should be taken, and as in the actual measurements no less difference than 1 millimetre is taken account of, the choice of unity as modulus would be somewhat less arbitrary. Arranged in seriation thus the arrangement is somewhat obscure, and if plotted out in the form of a

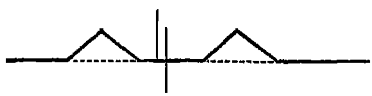
curve, the curve is now discontinuous, whereas with 2 as the modulus it was quite graphic. Still a trace of the same arrangement remains and the whole subject is thought worthy of notice.

The interest of this double grouping lies in the fact that according as a skull falls within one or the other group, so it is (at any rate in 80 per cent. of cases) dolicho-platycephalic, or the reverse.

If the race were homogeneous, one would expect the curve of the number of examples to rise gradually, attaining its maximum at the average (*a*),



whereas in the case of these male South Australians the curve happens to be of this sort (*b*),



two groups being observed. It seems then as if the dolicho-platycephalic individuals form a section only of the natives of South Australia. The number of cases (24) here considered is perhaps small, but the constant way in which the double maximum has been seen, first with twelve cases, then with twenty-four, warrants some amount of attention being paid to this method of grouping. At any rate if confirmed it would be a very graphic indication of the mingling of two types, and this is perhaps not far removed from what might be expected in the case of the South Australians, where an admixture of a Melanesian with a Tasmanian element is already suspected. To sum up, while the average male skull from South Australia is feebly dolicho-platycephalic, a study of individuals shows that few present this characteristic of the average skull, and that in fact they are either distinctly dolicho-platycephalic, or decidedly hypsi-cephalic. If both these types were met with in equal frequency, the average skull would have breadth and height indices equal. Actually, however, for twenty-four male skulls examined, the decidedly dolicho-platycephalic class are somewhat in excess of the decidedly hypsi-cephalic class (viz. 14 : 10) so that the average skull turns out to be as already said, feebly dolicho-platycephalic.

At the risk of rendering this discussion tedious, it must be said that the fact of a *single* character being the basis of an argument affecting the race was considered unsatisfactory, and it was thought that some confirmation of the groupings ought to be obtained from a study of

other characters. At first a number of seriations were made out for other characters, and it may be said at once, without any evidence of a decided nature being brought out. Next the specimens were arranged in order of size, as regards indices and several dimensions. This is in fact another kind of seriation. The difficulty occurred that among the twenty-four skulls the differences between the third, fourth, and fifth, for instance, with regard to any character (*e.g.* maximum length), might be much less than the differences between the twenty-second, twenty-third, and twenty-fourth in order. So that this table proved somewhat fallacious and certainly unwieldy.

Accordingly a modification was introduced (and I am much indebted to my friend Mr P. E. Bateman, of Jesus College, for aid in this arrangement) whereby the range of variation in the magnitude of each measurement or index was divided into six equal portions (the number six happened to be convenient, but is quite arbitrary), and all skulls whose dimensions placed them in the same division were regarded as occupying the same place in the order of the specimens. Thus there might be two specimens in the first rank, five in the second, and so on. Table XIII presents the arrangement.

With such an arrangement one would expect to find differences emphasized, if any exist. Also the curves corresponding to the figures would be expected to show signs of groups, if such are present. But as a matter of fact this particular arrangement does not admit of any statement as to groups being made, and the corresponding series of curves indicates a *double grouping in the case of basi-bregmatic height*, but in this alone, among the most important measurements studied. Next the corresponding set of figures was worked out for the *average* South Australian (as inferred from average dimensions) and the average Tasmanian. A comparison of these with each other, and with the individual South Australians, has so far only resulted in showing that one skull from South Australia (No. 2114), besides its superficial appearance, is in proportions nearly allied to the *average* Tasmanian type. As the whole of this method of seriations aims at the bringing forward of the individual characters, rather than those of the hypothetical average skull, no great importance ought to be attached to the last observations. It is very probable that when tables similar to Table XIII have been made out for an equal number of individuals from Tasmania on the one hand, and other districts in Australia on the other, important results may accrue.

Measurements in terms of Basi-nasal lengths. Passing to Table X. Here are arranged the principal measurements expressed in terms of the basi-nasal length. They have thus most interest in comparison

TABLE III.

Averages	All the skulls			
	29 *adults*, 5 *aged*, 4 *youths*			
		No.	Range	
Cubic capacity	1252·1	26	1020	1535
Maximum length	185·1	38	173	202
Ophryo-iniac length	178	37	166	195
Ophryo-occipital length	182	37	173	194
Maximum breadth	131	38	118	142
Bi-asterial breadth	108	34	97	119
Bi-stephanic breadth	103	34	89	118
Bi-auricular breadth	113	34	106	122
Minimum frontal breadth	94	37	79	104
External bi-orbital breadth	107	37	95	120
Bi-zygomatic breadth	128·5	21	108	145
Bi-malar breadth	115·5	30	95	128
Bi-maxillary breadth	92	31	76	103
Jugo-nasal breadth	100	30	86	117
Naso-mental length	111	16	90	121
Ophryo-alveolar length	95.	22	76	105
Naso-alveolar length	66·5	28	55	75
Basi-alveolar length	100	27	82	112
Basi-nasal length	99	33	84	110
Basi-bregmatic length	128	33	115	139
Basion to obelion, length	124	31	111	134
Basion to lambda, length	114	33	100	122
Basi-iniac length	81	33	70	90
Basion to opisthion, length	35	33	29	41
Breadth of foramen magnum	30	33	25	33
Orbital height	33	32	29	38
Orbital breadth	43	31	36	45
Nasal height	48	30	39	57
Nasal breadth	26	32	21	32
Palato-maxillary length	58	29	45	68
Palato-maxillary breadth	64	29	55	71
Arcs: Frontal	129	37	114	146
Parietal	128	37	114	145
Occipital superior	65	37	46	84
Occipital inferior	49	35	35	61
Supra-auricular	293	33	272	318
Oblique parietal	345	33	323	380
Jugo-nasal	112	30	95	129
Horizontal circumference	509	38	475	540
Anterior palatine breadth	29	31	27	34
Posterior palatine breadth	40	31	31	49
Minimum inter-orbital breadth ...	25	34	21	30
Occipito-spinal length	193	31	178	210
Occipito-alveolar length	200	28	182	220

TABLE III.—*continued.*

Averages	All the males — *24 adults, 5 aged*	No.	Range	
Cubic capacity	1269·9	20	1020	1535
Maximum length	188	29	175	202
Ophryo-iniac length	183	29	166	195
Ophryo-occipital length	183	29	173	194
Maximum breadth	132	29	118	142
Bi-asterial breadth	109	25	97	119
Bi-stephanic breadth	102	28	89	118
Bi-auricular breadth	115	26	106	122
Minimum frontal breadth	98	29	79	104
External bi-orbital breadth	108	29	97	120
Bi-zygomatic breadth	133	15	123	145
Bi-malar breadth	119	23	109	128
Bi-maxillary breadth	94	24	82	103
Jugo-nasal breadth	102	23	94	117
Naso-mental length	114	12	108	121
Ophryo-alveolar length	98	16	90	105
Naso-alveolar length	68	22	60	75
Basi-alveolar length	103	20	95	112
Basi-nasal length	101	25	93	110
Basi-bregmatic length	130·5	25	122	139
Basion to obelion, length	125	23	117	134
Basion to lambda, length	115	25	109	122
Basi-iniac length	81	25	70	90
Basion to opisthion, length	35	25	30	41
Breadth of foramen magnum	30	25	25	33
Orbital height	33	25	29	38
Orbital breadth	41	24	36	45
Nasal height	49	25	43	57
Nasal breadth	27	25	25	32
Palato-maxillary length	59	22	53	68
Palato-maxillary breadth	65	22	59	71
Arcs: Frontal	130	29	115	146
Parietal	129	29	118	145
Occipital superior	67	29	55	84
Occipital inferior	48	27	35	61
Supra-auricular	307	25	279	310
Oblique parietal	345	26	323	380
Jugo-nasal	113	23	104	129
Horizontal circumference	514	29	475	540
Anterior palatine breadth	30	24	27	34
Posterior palatine breadth	41	24	35	49
Minimum inter-orbital breadth	25	27	22	30
Occipito-spinal length	195	24	179	210
Occipito-alveolar length	203	21	182	220

TABLE III.—*continued.*

Averages	Males, without 4 doubtful ones			
	21 *adults*, 4 *aged*			
		No.	Range	
Cubic capacity	1235	17	1020	1445
Maximum length	188	25	175	202
Ophryo-iniac length	183	25	166	195
Ophryo-occipital length	183	25	173	194
Maximum breadth	131	25	118	140
Bi-asterial breadth	109	21	97	119
Bi-stephanic breadth	101	24	89	118
Bi-auricular breadth	114	22	106	122
Minimum frontal breadth	98	25	79	104
External bi-orbital breadth	108	25	97	120
Bi-zygomatic breadth	131	12	123	141
Bi-malar breadth	118	19	109	128
Bi-maxillary breadth	93	20	82	103
Jugo-nasal breadth	101·5	19	94	117
Naso-mental length	113	9	108	121
Ophryo-alveolar length	98	13	90	105
Naso-alveolar length	67	18	60	73
Basi-alveolar length	103	17	95	112
Basi-nasal length	101	22	93	109
Basi-bregmatic length	130	22	122	139
Basion to obelion, length	124	20	117	134
Basion to lambda, length	114	22	109	122
Basi-iniac length	82	22	70	90
Basion to opisthion, length	35	22	30	41
Breadth of foramen magnum	29	22	25	33
Orbital height	33	21	29	36
Orbital breadth	41	20	36	45
Nasal height	50	21	43	52
Nasal breadth	27	21	25	32
Palato-maxillary length	65·5	18	53	68
Palato-maxillary breadth	65	18	59	71
Arcs: Frontal	131	25	115	146
Parietal	128	25	118	145
Occipital superior	66	25	55	84
Occipital inferior	48	24	35	61
Supra-auricular	307	21	279	310
Oblique parietal	343	22	323	356
Jugo-nasal	113	19	104	129
Horizontal circumference	513	25	475	540
Anterior palatine breadth	30	20	27	34
Posterior palatine breadth	41	20	35	49
Minimum inter-orbital breadth ...	25	23	22	30
Occipito-spinal length	195	20	179	210
Occipito-alveolar length	204	18	191	220

TABLE III.—*continued.*

Averages	All the females but one			
	5 adults			
		No.	Range	
Cubic capacity	1174	2	1138	1210
Maximum length	177	5	175	180
Ophryo-iniac length	173	4	170	175
Ophryo-occipital length	176	4	175	178
Maximum breadth	128	5	124	134
Bi-asterial breadth	104	5	101	107
Bi-stephanic breadth	103	4	97	107
Bi-auricular breadth	109·5	4	106	112
Minimum frontal breadth	94	4	88	99
External bi-orbital breadth	105·5	4	103	106
Bi-zygomatic breadth	124	3	123	125
Bi-malar breadth	115	3	108	118
Bi-maxillary breadth	94	3	90	101
Jugo-nasal breadth	100	3	95	103
Naso-mental length	108·5	2	107	110
Ophryo-alveolar length	89	2	89	89
Naso-alveolar length	67·5	2	65	68
Basi-alveolar length	97	3	92	103
Basi-nasal length	95	4	92	99
Basi-bregmatic length	121	4	115	127
Basion to obelion, length	118	4	111	123
Basion to lambda, length	107	4	100	110
Basi-iniac length	81	4	72	89
Basion to opisthion, length	32	4	29	33
Breadth of foramen magnum	27·5	4	26	29
Orbital height	34	3	31	37
Orbital breadth	39	3	37	41
Nasal height	45	1	45	45
Nasal breadth	26	3	25	28
Palato-maxillary length	56	3	54	57
Palato-maxillary breadth	63	3	63	63
Arcs : Frontal	122·5	4	114	132
Parietal	121·5	4	114	128
Occipital superior	56	4	53	59
Occipital inferior	52·5	4	46	60
Supra-auricular	284	3	272	303
Oblique parietal	344·5	3	344	346
Jugo-nasal	111	3	106	114
Horizontal circumference	491	5	481	500
Anterior palatine breadth	28	3	27	29
Posterior palatine breadth	39	3	38	41
Minimum inter-orbital breadth ...	26	3	24	27
Occipito-spinal length	186	3	178	191
Occipito-alveolar length	197	3	190	200

TABLE IV.

Averages of the Indices	All the skulls				All the males			
	29 adults, 5 aged, 4 youths				*24 adults, 5 aged*			
Index		No.	Range			No.	Range	
Cephalic	70·5	38	64·9	76·6	70	29	64·9	76·6
Vertical	69·6	35	63·2	77	69·8	26	63·2	76
Alveolar	101·2	29	93·4	108·7	101·8	22	95	108·7
Orbital	82·6	31	70·5	94·9	81·2	24	70·5	92·7
Nasal	55·6	32	47·4	65·1	55·4	26	47·4	65·1
Palato-maxillary	111·7	29	92·2	128·3	110·4	22	92·2	128·3
Facial, total	95·4	14	87·5	105·5	96·2	10	87·5	105·5
Facial, superior (Broca)	73·4	19	66·7	84·7	73·7	13	66·7	84·7
Facial, superior (Kollmann)	51·7	21	47	58·5	51·8	15	47·1	58·5
Stephano-zygomatic	79·9	21	68·5	96·3	76·5	15	68·5	85·2
Gonio-zygomatic	72·9	15	65·35	79·7	72·3	11	65·35	77·9
Naso-malar	111·4	30	107·8	116·7	111·2	23	107·8	114
Dental (Flower)	45·2	13	33·6	50	44·2	10	33·6	49·5

TABLE IV.—*continued.*

Averages of the Indices	Males without the 4 doubtful ones				Adult females (5)			
	21 *adults*, 4 *aged*							
Index		No.	Range			No.	Range	
Cephalic	69·2	25	64·9	75·1	72·9	5	70·6	76·1
Vertical	69·3	23	63·2	76	68·6	5	65	71·6
Alveolar	102·15	19	95	108·7	102·7	3	97·9	104·3
Orbital	80·5	20	70·5	87·9	87·4	3	77·5	94·6
Nasal	55·9	22	51	65·1	53·25	2	51	55·5
Palato-maxillary	109·6	18	92·2	128·3	112·6	3	110·5	116·7
Facial, total	94·6	7	87·5	105·2	93·6	2	91·8	95·4
Facial, superior (*Broca*)	73·4	10	66·7	84·7	74·1	3	72·35	77·6
Facial, superior (Kollmann)	52·1	11	47·1	58·5	54	2	52·8	55·3
Stephano-zygomatic	75·8	12	68·5	85·2	81·9	3	78·9	85·6
Gonio-zygomatic	71·7	8	65·35	77·9	74·25	2	68·8	79·7
Naso-malar	111	19	107·8	114	110·4	3	108·7	111·6
Dental (Flower)	45·8	8	41·6	49·5	49·45	2	48·9	50

TABLE V. MEASUREMENTS ON THE LOWER JAW.

	MALES														A	FEMALES				B	C	D
Number of Skull	2101	2102	2105	2115	2119	2122	2128	2131	2133	2134	2137	2138	2139	2140	Average	2110	2124	2130	2132	Average	Average	Average
Height at symphysis ...	43	32	33	33	22	30	29	33	31	29	29	29	31	32	32	35	26	23	32	33·5	32	31·3
Coronoid height	70	45	67	50	61	58	57	68	73	68	59	65	54	65	61	63	44	46	55	59	59	58·9
Condylar height	63	48	64	49	54	49	52	65	73	63	58	61	54	61	58	61	44	41	52	56·5	56	56
Gonio-symphysial length	87	95	82	80	79	78	77	90	83	78	80	77	76	84	82	81	65	61	80	80·5	82	79·6
Intergonial breadth ...	101	102	109	83	97	95	93	99	113	96	93	91	96	105	98	98	79	84	86	92	97	95·35
Intercoronoid breadth ...	105	103	101	87	92	103	92	101	105	101	87	95	100	97	98	95	?	83	94	94·5	97	96·6
Intercondylar breadth, external	123	123	120	115	116	116	114	113	130	117	108	108	118	126	118	115	90	98	111	113	117	114·6
Intercondylar breadth, internal	81	92	78	79	?	78	79	71	85	79	68	69	80	82	78·5	78	62	74	72	75	79	77·1
Breadth of ascending ramus	39	39	36	38	33	32	34	43	38	40	41	35	37	40	38	36	32	31	36	36	38	37
Angle of ascending ramus	128°	123°	113°	133°	126°	132°	124°	127°	116°	114°	110°	107°	126°	102°	120°	112°	118°	127°	119°	115°·5	120°	120°
Basi-mental length ...	?	112	117	118	122	108	110	124	123(?)	106	106	111	117	115	113	116	90	90	103	109·5	113	109·5
Ophryo-mental length ...	160	138	138	138	112(?)	138	135	145	140	135	139	138	139	134	140	134	120	114	131	132·5	140	136·4

Average of all males without No. 2119: A.
Average of 2 adult females: B.
Average of males without Nos. 2119, 2131, 2133, 2134: C.
Average of all of both sexes: D.

TABLE VI. ADDITIONAL MEASUREMENTS.

Skull	Weight with jaw	Weight without jaw	Length of Parieto-sphenoid suture		Length of Lacrymo-ethmoid suture		Choanae or Posterior nares		Length of floor of nasal cavity	Least distance between the temporal crests
			Right	Left	Right	Left	Height	Breadth		
2101	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	66
2102	749	656	10	11	8	8	23	26	57	97
2104	—	669	10	6	9	(?)	22	27	50	93
2105	985	853	10	12	10	9	22	26	59	100
2106	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	100 (?)
2107	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	97 (?)
2108	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	111 (?)
2112	(?)	(?)	1	(?)	(?)	(?)	(?)	(?)	54 (?)	56
2113	(?)	629	—	—	9	9	23	30	56	71
2114	(?)	577	—	2	(?)	(?)	(?)	(?)	(?)	90
2115	893	784	(?)	(?)	7	5	22	27	58	108
2117	(?)	752	6	3	9	6	24	29	54	90
2118	(?)	669	3	11	9	9	28	29	54	75
2119	634	583	—	11	(?)	(?)	25	25	55 (?)	95
2122	639	559	—	—	—	3	24	28	52	95
2123	(?)	580	—	—	10	11	30	29	50	104
2125	(?)	533	13	14	(?)	11	27	32	53	104
2126	(?)	606	5	(?)	7	7	24	27 (?)	46	77
2127	(?)	686	11	(?)	(?)	(?)	27	27	46	89
2128	669	574	(?)	10	(?)	(?)	26	23	55	82
2129	(?)	(?)	3	3	(?)	(?)	(?)	(?)	(?)	94
2131	897	771	15	17	10	(?)	25	26	60	88
2133	800	677	10	12	(?)	14 (?)	(?)	(?)	50	96

TABLE VI. ADDITIONAL MEASUREMENTS—*continued.*

Skull	Weight with jaw	Weight without jaw	Length of Parieto-sphenoid suture		Length of Lacrymo-ethmoid suture		Choanae or Posterior nares		Length of floor of nasal cavity	Least distance between the temporal crests
			Right	Left	Right	Left	Height	Breadth		
2134	634	534	3	3	11	9	26	29	50	116
2136	(?)	(?)	13	5	(?)	(?)	(?)	(?)	(?)	113
2137	917	809	—	—	6	8	23	27	58	73
2138	830	722	2	—	7	6	26	27	54	65
2139	796	707	14	14	9	6	28	26	59	104
2140	816	711	7	8	6	10	22	29	61	77
2103	(?)	(?)	8	8	(?)	(?)	(?)	(?)	(?)	103 (?)
2110	811	705	—	—	7	7	22	27	54	95 (?)
2120	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	(?)	104
2121	(?)	532	—	9	2	·5 (?)	26	25	46	95
2132	719	623	5+w	16	6	7	23	24	48 (?)	119
2124	372	327	—	—	7	7	21	24	45	99
2130	(?)	404	14	12	6 (?)	6 (?)	19	29 (?)	44	116
2135	(?)	588	3	8	10	10	20	27	48	113
2111	(?)	586	3	—	(?)	(?)	23	23	49	91 (?)
Average of all ...	753·8 (16)	634·7 (29)	7·7 (22)	9·3 (21)	7·9 (20)	7·8 (19)	24·1 (27)	26·9 (25)	52·6 (26)	92·9 (32)
Average of males	781·5 (13)	665·5 (22)	8 (17)	8·9 (16)	8·5 (15)	7·8 (15)	25·8 (20)	27·5 (19)	54·1 (20)	89·6 (26)
Average of males without four doubtful cases	782·8 (10)	673·6 (18)	7·3 (13)	8 (12)	8·1 (13)	7·5 (13)	25·8 (17)	27·2 (16)	54·3 (16)	87·5 (22)
Average of females (adults)	765 (2)	620 (3)	6·5 (2)	11 (3)	5 (3)	7 (2)	23·7 (3)	28 (3)	50 (2)	106 (3)

TABLE VII. DIMENSIONS OF TEETH.

Number of Skull	Combined lengths of three molar teeth				Combined lengths of molars and premolars			
	Upper		Lower		Upper		Lower	
Males	Right	Left	Right	Left	Right	Left	Right	Left
2101	34	34	39	38	49	49	54	53
2102	32	32	(?)	(?)	46	46	(?)	(?)
2105	31	32	34	35	48	45	50	49
2115	33	32	35	36	51	—	—	—
2117	(?)	32	(?)	(?)	(?)	46	(?)	(?)
2118	29	29	(?)	(?)	42	42	(?)	(?)
2127	(?)	(?)	(?)	(?)	43(?)	(?)	(?)	(?)
2128	31	32	35	33	47	(?)	(?)	(?)
2131	(?)	(?)	(?)	(?)	(?)	(?)	37	(?)
2133	(?)	(?)	(?)	(?)	46(?)	(?)	(?)	(?)
2134	30	(?)	(?)	(?)	44	(?)	(?)	(?)
2137	29	30	31	32	43	44	46	46
2138	32	35	37	37	46	47	52	51
2139	(?)	(?)	35	(?)	44	44	49	49
2140	39	37	40	(?)	50	50	57	(?)
Females								
2110	(?)	(?)	(?)	32	(?)	(?)	(?)	35
2121	32	31	(?)	(?)	46	46	(?)	(?)
2132	29	30	33	(?)	(?)	(?)	46	(?)
Youths								
2111	30	31	(?)	(?)	44	43	(?)	(?)
2135	29 (?)	(?)	(?)	(?)	42(?)	(?)	(?)	(?)
Average of males	32 (10)	32·5 (10)	36 (8)	35 (6)	46 (11)	46 (9)	49 (7)	50 (5)
Average of females	30·5 (2)	30·5 (2)	33 (1)	32 (1)	46 (1)	46 (1)	46 (1)	(?)

PART OF TABLE IX.

Seriations of Basi-Bregmatic Height.

Adult well-authenticated males from South Australia are considered only.

Cambridge University collection		All available specimens	
Modulus 2 units		Modulus 2 units	
120—122	1	120—122	1
122—124	2	122—124	3
124—126	3	124—126	5
126—128	0	126—128	1
128—130	0	128—130	1
130—132	3	130—132	5
132—134	0	132—134	3
134—136	1	134—136	1
136—138	1	136—138	2
138—140	1	138—140	1
		140—142	1
Modulus 5 units		Modulus 5 units	
115—120	—	120—125	8
120—125	5	125—130	3
125—130	1	130—135	9
130—135	4	135—140	3
135—140	2	140—145	1

TABLE X. MEASUREMENTS COMPARED WITH BASI-NASAL LENGTH = 100.

	A	B	C	D
Cubic capacity	1264·7	*1257·4*	1222·8	1235·7
Maximum length	187	186·1	186·1	186·3
Ophryo-iniac length	179·8	182·2	182·2	182·1
Ophryo-occipital length	183·8	182·2	182·2	185·3
Maximum breadth	132·3	130·7	129·7	134·7
Bi-asterial breadth	109·1	107·9	107·9	109·5
Bi-stephanic breadth	104	101	100	108·5
Bi-auricular breadth	114·1	113·9	112·9	115·3
Minimum frontal breadth	94·9	97	97	98·9
External bi-orbital breadth ...	108·1	106·9	106·9	111·05
Bi-zygomatic breadth	129·8	131·7	129·7	130·5
Bi-malar breadth	116·7	117·8	116·8	121·05
Bi-maxillary breadth	92·9	93·7	92·8	98·9
Jugo-nasal breadth	101	101	100·4	105·3
Naso-mental length	112·1	112·9	111·9	114·2
Ophryo-alveolar length	95·95	97	97	93·7
Naso-alveolar length	67·2	67·3	66·3	71·05
Basi-alveolar length	101	102	102	102
Basi-nasal length	100	100	100	100
Basi-bregmatic length	129·3	129·3	128·7	127·4
Basion to obelion, length	125·25	123·8	122·8	124·2
Basion to lambda, length	115·15	113·9	112·9	113·7
Basi-iniac length	81·8	80·2	81·2	85·3
Basion to opisthion, length ...	35·35	34·65	34·65	33·7
Breadth of foramen magnum ...	30·3	29·7	28·7	28·9
Orbital height	33·3	32·7	32·7	35·8
Orbital breadth	43·4	40·6	40·6	41·05
Nasal height	48·5	48·5	49·5	47·4
Nasal breadth	26·3	26·7	26·7	27·4
Palato-maxillary length	58·6	58·4	64·85	58·9
Palato-maxillary breadth	64·6	64·35	64·35	66·3
Arcs: Frontal	130·3	128·7	129·7	128·9
,, Parietal	129·3	127·7	126·7	127·9
,, Occipital superior	65·65	66·3	65·3	58·9
,, Occipital inferior	49·5	47·5	47·5	55·3
,, Supra-auricular	295·95	304	304	298·9
,, Oblique parietal	348·5	341·6	339·6	362·6
,, Jugo-nasal	113·13	111·9	111·9	116·8
Horizontal circumference	514·1	508·9	507·9	517·9
Anterior palatine breadth	29·3	29·7	29·7	29·5
Posterior palatine breadth	40·4	40·6	40·6	41·05
Minimum inter-orbital breadth ...	25·25	24·75	24·75	27·9
Occipito-spinal length	194·9	193·1	193·1	195·8
Occipito-alveolar length	202	201	202	207·4
Mandible: Symphysial height ...	31·6	31·7	31·7	35·3
,, Coronoid height ...	59·5	60·4	58·4	62·1
,, Condylar height ...	56·6	57·4	55·4	59·5
,, Gonio-symphysial length	80·4	81·2	81·2	84·7
,, Intergonial breadth ...	96·3	97	96	96·8
,, Intercoronoid breadth ...	97·6	97	96	99·5

TABLE X. MEASUREMENTS COMPARED WITH BASI-NASAL LENGTH = 100.—*continued.*

	A	B	C	D
Mandible: Intercondylar breadth, external	115·75	116·8	115·8	118·9
" Intercondylar breadth, internal	77·9	77·7	78·2	78·9
" Breadth of ascending ramus	37·4	37·6	37·6	37·9
" Basi-mental length ...	110·7	111·9	111·9	115·3
" Ophryo-mental length	137·8	138·6	138·6	139·5
Length of parieto-sphenoid suture	(7·8) (9·4)	(7·9) (8·8)	(7·2) (7·9)	(6·8) (11·1)
Length of lacrymo-ethmoid suture	(8) (7·9)	(8·4) (7·7)	(8) (7·4)	(5·3) (7·4)
Height of posterior nares	24·3	25·5	25·5	24·8
Breadth of posterior nares ...	27·2	27·2	27	29·5
Length of floor of nasal cavity ...	53·1	53·6	53·6	52·6
Least distance between temporal crests	93·8	88·7	86·6	111·6

Column A. All the skulls.
" B. All the males.
" C. Males without four doubtful specimens.
" D. Females.

TABLE X (*a*). COMPARISON OF THE DIMENSIONS REDUCED IN PROPORTION TO BASI-NASAL LENGTH (AVERAGE) = 100.

Series of skulls	(12) Andamanese	Fiji: (6)	Torres Sts.	Australians	
Average value of basi-nasal length	95	104	103·4	101	Male skulls only considered
Cubic capacity	131	144	137·5	122·2	
Maximum length	176	188	184·3	186·1	
Basi-bregmatic height	136	137	130·9	128·7	
Maximum breadth	142	123	125·7	129·7	
Minimum frontal breadth	97	93	95·1	97	
Bi-auricular breadth	120	112	114·6	112·9	
Horizontal circumference	505	512	498·4	507·9	
Supra-auricular transverse arc	300	289	283	304 (?)	
Frontal arc	127	130	124·6	129·7	
Parietal arc	129	138	126·4	126·7	
Occipital arc	109	118	114·5	112·8	
Length of *foramen* magnum	35	33	36·7	34·65	
Basi-alveolar length	101	103	106·6	102	
Bi-zygomatic breadth	132	131	130·8	129·7	
Bi-malar breadth	118	115	116	116·8	
Interorbital breadth	25	25	24·2	24·75	
Orbital breadth	38	38	39·2	40·6	
Orbital height	35	32	30·9	32·7	
Nasal height	48	47	46·6	49·5	
Nasal breadth	25	26	24·9	26·7	

TABLE XI.

	No. of cases examined	Occurrence on Right Side	Occurrence on Left Side	
Teeth struck out	33	2	1	In all three median upper incisor has been thus lost: the right in natives from New South Wales and Victoria respectively, the left in a South Australian.
Pterion ossicles	31	5	4	And in one case only (No. 2137 from N. Territory) on both sides.
Pterygo-spinous ligament ...	17	—	—	Indications in seven instances, in nearly all these on both sides.
Anterior lacerate foramen ...	32	—	1	In seven cases nearly closed on both sides, in one on left side only.
Sphenoid contribution to glenoid fossa	32	2	1	The spine is prolonged thus in twenty-one cases on both sides, in two on right, in one on left only.
Post-condylar foramina ...	30	5	1	Are pervious in seven cases on both sides, in five on the right, in one on the left only.
Mastoid foramina	30	4	3	Occur ten times on both sides, four on the right and three on the left only.
Vesalian foramina	33	4	7	Occur in twelve cases on both sides, in four on the right, in seven on the left only.
Styloid processes	17	—	—	In ten cases rudimentary, of considerable length in seven cases.
Para-mastoid processes	31	1	1	Very large in one case (male No. 2105).
Tuber maxillare	31	—	—	In eight cases is large, in two is insignificant.
Third occ. condyle	33	—	—	Traces in five cases, especially distinct in No. 2137.
Ext. pterygoid fossae	27	—	—	Are deep in eleven cases, shallow in thirteen.
Ext. pterygoid plates	29	—	—	Project strongly in seventeen, moderately in nine, nearly vertical in three.
Infra-temporal crest	35	—	—	Distinct in twenty-nine cases, usually spiny, sometimes tuberous.
Post. palatine spine	28	—	—	In seventeen cases rounded, in six obtuse, in four acute, undeveloped in one.
Hamulus lacrymalis	22	9	8	Present in six cases on both sides.
Axes of orbits	34	—	—	Horizontal in eighteen, droop slightly externally in sixteen cases.
Infra-orbital suture	30	12	11	Present on both sides in eleven cases, in two on right only, traces in five other cases.
Fronto-max. suture	24	1	—	One case only.
Div. of malar	30	3	4	On both sides in three cases, on one side (the left) in one case only.
Div. of occipital	37	9	9	In nine cases, and in all on both sides.
Squamo-mastoid angle	38	—	—	Obtuse in thirty cases (in three reaches 180°), acute in six cases (nearly 90° in one), one synostosed.
Parietal foramina	36	15	14	On right alone, eleven; on left alone, ten; on both sides, four; on neither side, eleven.
Spheno-maxillary suture outside orbit	29	11	10	In ten cases on both sides, in one case on right only, absent from seventeen cases.

TABLE XII. AVERAGES OF INDICES FROM ALL AVAILABLE DATA.

Measurement of Index	All skulls	No.	Male skulls	No.	Female skulls	No.
Cubic capacity	1246·5	150	1297	97	1148·5	49
Cephalic index	70·95	214	70·25	111	72·4	53
Vertical index	71·5	171	71	108	71·4 (?)	52
Alveolar index	101·1	114	100·4	73	103·1	33
Nasal index	55·1	169	55·75	77	54·9	26
Orbital index	81·3	175	80·2	101	84·9	46
Stephano-zygomatic index	82·05	133	79·8	95	85·6	35
Palato-maxillary index	110·1	63	112	44	110·3	14
Total facial index	99·4	21	96·2	10	93·6	2
Superior facial index (Broca)	68·9	74	68·5	31	68·2	10
Superior facial index (Kollmann)	49·9	54	49·9	36	49·8	11
Gonio-zygomatic index	71·9	40	71·6	25	70·1	7
Dental index (Flower)	45·3	49	45·1	30	46·5	16

TABLE XIII.

	2101	2102	4	5	6	7	8	12	13	14	15	17	18	22	28	T_1	T_2	T_3	T_4	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	T	Av
Breadth Index	1	4	5	4	4	2	5	1	5	6	2	3	2	5	2	2	3	4	2	6	4	5	5	4	4	3	4	6	4
Height Index	?	5	4	3	5	1	?	5	6	2	1	5	1	4	2	4	1	4	1	6	3	5	1	1	1	4	5	4	3
Gnathic Index	?	6	4	6	?	?	?	?	3	6	6	5	3	1	3	2	5	?	?	3	5	5	?	?	?	5	3	6	4
Nasal Index	6	1	2	2	?	?	?	2	1	6	1	1	6	3	1	1	3	?	3	1	1	4	?	?	?	5	1	4	4
Orbital Index	3	3	5	3	?	?	?	?	5	5	5	5	5	1	3	4	6	?	1	5	5	4	?	?	?	3	3	3	3
Length	6	1	2	4	3	5	3	2	4	3	5	3	5	3	3	4	6	2	4	3	4	3	5	4	6	4	1	2	3
Breadth	4	3	3	5	4	4	5	1	3	6	3	3	4	5	2	4	5	2	3	5	6	4	6	5	6	4	2	5	4
Height	?	3	1	4	5	2	?	4	6	1	1	5	1	4	1	4	3	2	1	6	4	5	1	1	2	4	3	1	2
B. N.	?	5	1	4	?	4	?	3	6	1	5	4	4	4	5	6	6	?	6	6	6	6	?	?	?	5	4	1	4
B A.	?	6	1	5	?	?	?	?	4	2	6	4	2	1	3	4	5	?	?	5	5	5	?	?	?	5	2	1	4
Nasal Height	5	5	3	4	?	?	?	2	4	1	4	4	4	5	5	4	5	?	2	6	5	6	?	?	?	5	4	2	4
Nasal Width	6	1	1	1	?	?	?	1	1	3	1	1	5	3	1	1	3	?	1	2	1	5	?	?	?	6	1	2	2
Orbital Height	4	2	1	1	?	?	?	?	2	1	2	2	4	1	1	2	6	?	1	2	4	4	?	?	?	2	1	1	2
Orbital Width	6	5	1	4	?	?	?	?	3	2	3	3	5	6	3	3	5	?	5	2	4	5	?	?	?	5	3	3	3
Capacity	?	2	1	5	?	?	?	?	5	4	2	4	3	5	1	3	6	?	?	6	3	6	5	4	5	6	1	3	3
Horizontal Circumference	6	1	1	4	2	3	4	1	4	2	3	2	3	3	2	4	6	?	4	3	3	3	6	3	6	3	1	2	3

Table XIII is a seriation of South Australian crania: the Cambridge specimens are denoted by numerals; Turner's specimens are T_1—T_4 inclusive; F_1—F_8 are specimens described by Flower, T is a Tasmanian cranium at Cambridge and *Av* represents the average Australian cranium.

The table gives the results of an analysis (for the suggestion of which I am indebted to the Rev. P. E. Bateman, M.A., of Jesus College, Cambridge) undertaken with a view to ascertaining if the suggestion of two distinct groups of the forms of the skull, a suggestion provided by the measurements of the basi-bregmatic height, could be confirmed from the figures provided by other characters. The method of seriation has already been explained, and the present analysis is a modification of the ordinary method. Some sixteen characters represented by numerical expressions are chosen for investigation: the total range of value given by each is divided arbitrarily into six groups representing equal ranges of variation between the extremes. For any character we thus have the crania divided into six groups: in the seriation each cranium within a group is distinguished only by the number of that group. Thus the groups are 1—6, crania A, X, Z, may come within Group 1, and would each be represented by the figure 1 and not by their individual character as shown by the value of the particular index in question in their cases; to take a further example cranium No. 2101 is in Group 1 as regards its breadth-index, in Group 6 as regards its nasal-index and so on (cf. table).

Now what one might expect, were two homogeneous groups present among the collected crania, is that in each group the allied skulls would when tested by the several indices, come to possess the same designative figure: that they would in fact come within the same group out of the six formed as described, by the division of the range of variation of each character. But the table cannot be said to show this, so that the present mode of analysis lends no support to the suggestion that the South Australian aborigines may contain two different stocks, distinguished by their cranial proportions: or at least it seems as if such distinction were confined almost wholly to the single character of the basi-bregmatic height of the skull.

ADDITIONAL NOTES ON CRANIA OF AUSTRALIAN ABORIGINES.

THE following notes refer to three male skulls: of which one is in the Cambridge Museum, the others in the possession of Dr Haddon and the Rev. J. B. Lock, respectively: the exact localities whence they came could not be ascertained. The principal points of interest are the following: The skull *A* is a heavy-browed prognathous skull of small cubic capacity; the central upper incisor tooth on the right side has been punched out. The remaining teeth are in good preservation; synostosis commencing in the sutures near the pterion on each side denotes the maturity of the specimen. It is a typical male skull of the "hypsistenocephalic" variety, and resembles specimens from the North-western parts of Australia and from Queensland.

In the specimen *B*, a large trephine hole (made *post mortem* apparently) pierces the right parietal bone. The most noticeable feature is the irregularity of the contour of the cranial vault in the median sagittal plane; this conformation, which has been termed bathrocephalic[1], is unusual in skulls of aboriginal Australians. Besides, the specimen is scaphocephalic to a degree noticeable even in an Australian skull, and this is no doubt connected with the early obliteration of the sagittal suture, of which only slight traces persist (though the wisdom teeth have not yet completely perforated the alveolar margins). An exception to the last statement must however be made in the case of the third molar on the left side of the mandible, which is cutting its way through the alveolar border so displaced that its crown looks directly forwards instead of upwards; and abuts on the posterior surface of the adjacent second molar. The molar teeth are

[1] Two other skulls in the Cambridge collection, one being that of a Frenchwoman, present this peculiarity. In an article by Giacomini in the *Archives Italiennes de Biologie*, 1882, p. 251, a similar skull is figured, and the brain contained in it is described as possessing a double Rolandic sulcus. This, however, does not invariably accompany the deformity, for the Rolandic region was normal in a bathrocephalic head dissected in this Anatomy School.

all of great size, and show but slight evidence of usage. The petrous bones bear sharp eustachian processes on their inferior surfaces, and the foramen ovale on the left side is only separated from the petro-sphenoid suture by an exceedingly thin bony lamina, and even the latter is absent from the right side on which the foramen spinosum is deficient. These are probably examples of the persistence of a state of affairs normal in the fœtus.

Skull 2154 in the Cambridge Catalogue.—This is another very prognathous specimen presenting in a marked degree the features typical of the aboriginal Australian cranium. It is the skull of an adult male, but is not of advanced age, as the wisdom teeth have not long pierced the alveolar margins of the jaws. The right central upper incisor has been punched out. Marked scaphocephaly is shown, but it is noteworthy that the sagittal suture is here quite unaffected by synostosis. There is a large epipteric ossicle on the left side.

Measurements relating to these three specimens have been recorded in tabular form. On comparing these with the figures drawn up as averages from measurements of the crania already in the Museum (cf. pp. 98 *et seq.*), I find exceedingly little deviation from the average. Two points are worthy of remark however: the orbital breadth, 47 mm., of the skull *A*, exceeds the average (41 mm.) drawn from measurements of twenty male crania: and the skulls *A* and 2154 are a good deal lighter than the average skull; this diminution in weight seems to affect both cranium and mandible. Lastly, observations made in reference to certain characteristics of Australian crania, gave results as follows: Hypsistenocephaly, supra-orbital notches (not foramina), vesalian foramina and a transverse occipital torus, occur in each specimen. The glenoid cavities are moderately deep in *A*, but much more shallow in *B* and in 2154, and in the latter give evidence of osteo-arthritis. The great wings of the sphenoid are deeply channelled on their external surfaces in *A* and 2154, but not in *B*.

The outline of the squamous part of the temporal bone on the side of the cranium, shows an angle where the mastoid portion joins it in *A* and 2154, but in *B* the transition is more gradual.

Cranium denoted by *A* in the possession of Rev. J. B. Lock.
„ „ *B* „ „ Dr Haddon.
„ „ No. 2154 in the Anatomical Museum.

THREE CRANIA OF AUSTRALIAN ABORIGINES.

TABLE OF MEASUREMENTS.

Catalogue number	*A*	2154	*B*
Age	Adult	Adult	Adult
Sex	♂	♂	♂
Cranial capacity	1225	1180	1300
Maximum length	180	175	193
Ophryo-iniac length	175	171	183
Ophryo-occipital length	176	170	189
Maximum breadth	127	133	130
Bi-asterial breadth	107	104	112
Bi-stephanic breadth	108	100	108
Bi-auricular breadth	119	116	112
Minimum frontal breadth	98	90	95
External bi-orbital breadth	110	106	107
Bi-zygomatic breadth	137	136	123
Bi-malar breadth	118	98	115
Bi-maxillary breadth	98	98	89
Jugo-nasal breadth	103	102	101
Naso-mental length	120	114	110
Ophryo-alveolar length	95	82	89
Naso-alveolar length	74	64	64
Basi-alveolar length	102	108	99
Basi-nasal length	101	98	100
Basi-bregmatic length	132	132	136
Basion to obelion, length	130	127	124
Basion to lambda, length	117	110	115
Basi-iniac length	82	73	80
Basion to opisthion, length	41	33	34
Breadth of foramen magnum	32	30	27
Orbital height	34	30	34
Orbital breadth	47	41	42
Nasal height	52	46	44
Nasal breadth	32	29	31
Palato-maxillary length	59	56	60
Palato-maxillary breadth	68	62	71
Arcs: Frontal	124	124	136
Parietal	124	118	141
Occipital superior	72	66	68
Occipital inferior	44	45	47
Supra-auricular	297	293	295
Oblique parietal	343	346	353
Jugo-nasal	118	110	114
Horizontal circumference	496	487	515
Minimum inter-orbital breadth	26	23	25
Occipito-spinal length	191	170	195
Occipito-alveolar length	201	180	205
Mandible: Symphysial height	34	36	33
Coronoid height	64	62	56
Condylar height	60	59	51
Gonio-symphysial length ...	75	80	80

TABLE OF MEASUREMENTS—*continued.*

Catalogue number	*A*	2154	*B*
Age	Adult	Adult	Adult
Sex	♂	♂	♂
Mandible:			
Inter-gonial breadth	90	105	96
Inter-coronoid breadth	104	100	94
Inter-condylar breadth, exterior	130	121	115
Inter-condylar breadth, interior	91	88	72
Breadth ascending ramus	33	36	33
Angle	123°	107°	110°
Basi-mental length	110	108	103
Ophryo-mental length	141	135	135
Weight of jaw	80	92	85
Weight of jaw and skull	707	593	749
Weight of skull	627	501	664
	R.L.	R.L.	R.L.
Length, parieto-sphenoid suture	12	3 w[1]	11.11
		L.	L.
Length, lacrymo-ethm. suture	13.8	7.5	8.9
Choanæ, height	22	26	20
Choanæ, breadth	32	28	29
Length, floor of nasal cavity	53	57	52
Combined length three molar teeth	{29 29} {32 31}	29	57
Length, molars and pre-molars	{43 43} {45 45}	41	52
Least distance between temporal crests	99	92	106
Index: Cephalic	70·6	72·6	67·4
Vertical	73·4	75·4	70·5
Alveolar	101	110·2	99
Orbital	72·3	73·2	81
Nasal	61·5	63·4	70·5
Palato-maxillary	115·3	106·9	118·4
Facial (total)	97·76	100·74	91·2
Facial superior (Broca)	69·34	60·3	72·35
Facial superior (Kollmann)	54	47·1	52
Stephano-zygomatic	78·8	73·5	87·8
Gonio-zygomatic	65·68	77·2	78·04
Naso-malar (O. Thomas)	114·6	107·8	112·87
Dental (Flower)	42·6	41·8	52
Pterion-ossicles R.	absent	absent	absent
Pterion-ossicles L.	absent	present	absent
Tuber maxillare	large	large	small
Inferior temporal crest	spiny	spiny	tubercle
Posterior pal. spine	obtuse	acute	bifid
Fronto-maxillary suture	absent	absent	absent
Spheno-maxillary suture (sub-orbit)	present	absent	absent

[1] w denotes a wormian bone.

NOTES ON SKULLS FROM QUEENSLAND AND SOUTH AUSTRALIA.

Two of the specimens under consideration were added to the University Museum by T. Flood, Esq., M.D. They are from Croydon, in North Queensland.

No. 1 is the very dolicho-cephalic skull of an adult male, which possesses many striking features known to characterise Australian crania. Thus, its external dimensions are small, and so is its capacity (1255 c.c.); the brows are massive and overhanging, the upper jaw large with strong supporting malar bones and zygomatic arches.

In norma verticalis it is distinctly phænozygous; synostosis has progressed to a considerable extent in the sagittal suture, less in the coronal; there is a single parietal foramen.

In norma lateralis, prognathism is almost the first feature that one notices (though it is not brought out by the figure of the gnathic index). The mandible is massive, with a lower angle (108°) than usual (120°), the sigmoid notch is shallow. On the left side there is a fronto-squamous articulation at the pterion, and the contour of the squamous portion of the temporal bone on the skull is much depressed, the angle between squamous and mastoid portions being exceedingly open, so that there is almost a straight line from pterion to asterion. The temporal ridges are double but indistinct.

In norma basilaris a large, wide palate with a large anterior foramen is seen. The channelling of the greater alæ of the sphenoid near the pterion, so marked in some Australian crania, is absent in this case. Some arrest of development seems to have affected the internal pterygoid plate on the right side. The glenoid cavity is remarkably shallow. A third and median condyle is seen on the anterior part of the lip of the foramen magnum.

In norma occipitalis the pentagonal form is marked; a transverse torus crosses the occipital bone near the inion, other muscular crests

and ridges are not strongly developed. The conceptacula cerebelli are not very prominent, so that the skull rests on the opisthion and molar teeth when on a plane surface (and without the mandible).

In norma facialis, nasal synostosis is observed to be almost complete, the lower margins of the apertura pyriformis indistinct; the right upper median incisor has been lost early in life. The vault of the skull, though fairly rounded in the frontal region, is ill-filled and gable-shaped posteriorly to the bregma.

No. 2 is a very long and prognathic female skull, apparently of about the same age as the male skull just described. Allowing for the sexual differences (which concern chiefly the prominence of the glabella and the stoutness of the facial skeleton), there is much general similarity of the two skulls.

In norma verticalis this female skull is somewhat coffin-shaped and the zygomatic arches are just obscured from view. It is remarkable that synostosis of the bones of the brain-case has practically not commenced (being limited to a slight indication at the left stephanion); the wear of the teeth however would indicate an age certainly as great as that of the male skull just described, where synostosis had long commenced.

In norma lateralis it appears that all parts of the face and the mandible contribute to the appearance of prognathism. The mandible is strong, with a more open angle than in the other case; the sigmoid notch is shallow. The nose is very flat; there are epipteric ossicles on each side, and the contour of the squamous portion of the temporal bone on the wall of the cranium is much flattened; the basi-bregmatic length is considerable.

In norma basilaris, a wide, deep palate with large anterior foramen is seen; the glenoid fossæ are shallow; the occipital condyles prominent and everted, with post-condylar fossæ and foramina.

In norma occipitalis a transverse torus crosses the occipital bone; the digastric groove is very deep, but muscular ridges are otherwise feebly developed.

In norma facialis the scaphocephalic character involving the frontal bone is at once evident. The nose is very wide, its borders sharp above but indistinct below. Both median incisors have long been lost (or extracted artificially), and their sockets are occupied by deep fossæ.

The above notes present the more interesting features of the specimens. To select the characteristics of the pair would be to emphasize: (1) the prognathism, (2) the great vertical height from basion to bregma, (3) the shallowness of the glenoid fossa. Of these,

the marked prognathism is interesting from the fact of the same characteristic distinguishing Melanesian skulls; the same may be said of the basi-bregmatic height. As regards this latter, the result is a height index greater than a breadth index. Such a condition is common in Melanesians, common in skulls from the more northern parts of Australia, but progressively rarer as one advances to the south.

Of the significance of a shallow glenoid fossa, the third characteristic mentioned, one can speak only with much less confidence. The feature is not constant in Australians and occurs in skulls of other races. It is a persistence of a state of affairs normal in earlier life (and is noticed in various races, notably in the South Australian skull hereafter described).

It remains to compare our Queensland skulls with others from the same locality. Such are recorded by Flower, Turner, De Quatrefages, Hamy, Cauvin *et alii*. The female skull here described bears a marked similarity to a female skull figured in the *Crania Ethnica* as that of an Australian woman from "Camp in Heaven." For other comparisons we are dependent on recorded measurements; of such there are the cases described by Professor Turner, who records dimensions of some six skulls from Queensland. These, though in the small cephalic index and high vertical index corresponding with the two skulls here considered, seem absolutely of greater dimensions, the facts being indicated by the greater length and horizontal circumference.

In one of Professor Turner's cases the cubic contents were 1514 c.c., which is remarkably high for an Australian cranium.

Professor Flower records the measurements of a female skull from Queensland, where the cephalic and vertical indices are equal—an unusual occurrence, the latter being usually the higher in skulls from this region. The figures also indicate that this female was platyrrhine; herein it agreed with the "Croydon" female skull, and it appears that the nose is more flat in the females than in the males of these tribes.

(This skull (1043) approaches the female "Croydon" skull nearly in measurements and capacity.)

Lastly, M. Cauvin has recorded the indices relating to several skulls from Queensland; from these tabulations one sees that the cephalic index very rarely exceeds 71.

It might be noticed in conclusion that the male skull here described bears a general resemblance, confirmed by examination of measurements, to a skull in the University collection from the northern territory of South Australia, so that probably the same influences have determined the particular type in both instances.

The third skull is that of a microcephalic adult or aged male from

Adelaide. It was presented by Dr Watson, and has been longitudinally bisected. The left half is a good deal damaged and fractured, and the mandible is absent. Synostosis of the sagittal and lambdoidal sutures is almost complete. The most striking features about the cranium are: the very massive prognathous upper jaw, with small but sharp nasal spine; the marked scaphocephaly; the great basi-bregmatic height; the remaining condyle is curiously prominent and everted; the squamous and mastoid portions of the temporal bone join at a sharp angle on the side of the skull, herein offering a marked contrast with the skulls from Queensland.

The arrangement of the infra-orbital canal on the right side is remarkable, for on the floor of the orbit is a small and shallow canal, but a large foramen opening further back on the spheno-maxillary fissure transmits the bulk of the nerve.

The section discloses the great extent of the air-sinuses in the bones of the face as well as the great thickness of the skull-wall in the region of the occipital protuberance: the long, slender, forwardly-directed posterior clinoid processes are also to be noticed.

On the whole, the dimensions of this skull accord fairly well with those of other skulls from South Australia, but the basi-bregmatic height is the greatest in this case of all the South Australian crania in the University Museum.

DIMENSIONS OF AUSTRALIAN SKULLS (Nos. 1 and 2 from North Queensland; No. 3 from South Australia).

	Skull 1	Skull 2	Skull 3
Age	Adult	Adult	Adult
Sex	♂		♂
Cubic capacity	1255	1205	1300?
Maximum length	179	176	188
Ophryo-occipital length	178	176	186
Ophryo-iniac length	175	171	183
Occipito-spinal length	184	178	199
Occipito-alveolar length	190	?	211
Maximum breadth	123	123	134
Bi-asterial breadth	92	94	101
Bi-auricular breadth	112	107	111
Bi-stephanic breadth	113	97	95
Minimum frontal breadth	91	92	87
External bi-orbital breadth	101	103	104?
Minimum inter-orbital breadth	25	23	25?
Bi-zygomatic breadth	132	123	130?
Bi-malar breadth	111	108	115?
Bi-maxillary breadth	89	86	98?
Jugo-nasal breadth	93	97	100?
Orbital height	32	33	32
Orbital breadth	39	40	40
Nasal height	47	43	45
Nasal breadth	27	27	25
Palato-maxillary length	56	57	69
Palato-maxillary breadth	62	65	65
Arcs: Frontal	135	131	125
Parietal	123	135	134
Occipital superior	59	55	70
Occipital inferior	49	43	47
Oblique parietal	340	340	
Jugo-nasal	105	107	110
Horizontal circumference	489	485	510
Length; opisthion to basion	39	35	39
Basi-mental length	101	108	?
Basi-alveolar length	94	97	111
Basi-nasal length	97	97	103
Basi-glabellar length	106	105	112
Basi-bregmatic length	135	136	141
Basion to obelion	127	?	131
Basi-lambdoid length	117	105	120
Basi-iniac length	84	71	83
Ophryo-mental length	136	125	?
Ophryo-alveolar length	89	75	95
Naso-mental length	111	105	?
Naso-alveolar length	63	55	68
Width of foramen magnum	29	29	30?
Length of molar and pre-molar teeth ...	43·5	?	?

DIMENSIONS OF AUSTRALIAN SKULLS—*continued.*

	Skull 1	Skull 2	Skull 3
Age	Adult	Adult	Adult
Sex	♂	♀	♂
Anterior palatine breadth	28	33?	31
Posterior palatine breadth	35	39	40
Length of parieto-sphenoid suture R. ...	10	11	6
„ „ „ L. ...	7?	6+w[1]	4 sq. fr.
Length of lacrymo-ethmoid suture R. ...	6	9	11
„ „ „ L. ...	8	7	9
Choanæ: height	21	24	24
„ breadth	28	28	31?
Anterior to posterior nasal spine	55	49	55
Mandible:			
Height at symphysis	34	33	
Coronoid height	63	60	
Condylar height	65?	56?	
Gonio-symphysial length	85	77	
Inter-gonial breadth	91	91	
Inter-coronoid breadth	95	91	
Inter-condylar breadth, external	121	101	
Inter-condylar breadth, internal	81	74	
Breadth of ascending ramus	34	35	
Angle of ascending ramus	108°	124°	
Weight of skull—			
With mandible	736	635	
Without mandible	551	485	
Least distance between temporal crests (*i.e.* behind coronal suture)	98	98	
Supra-auricular transverse arc	295	295	300
Indices: Cephalic	68·7	69·9	71·3
Vertical	75·5	77·3	75
Gnathic	96·9	100?	107·8
Orbital	82	82·5	80
Nasal	57·5	62·8	55·5
Palato-maxillary	110·7	114·2	106·15
Facial (total)	97·6	98·4	?
Facial superior (Broca)	67·4	61	73·8?
Facial superior (Kollmann) ...	47·7	44·7	52·3?
Stephano-zygomatic	85·6	78·9	73·8?
Gonio-zygomatic	69	74	?
Naso-malar	112·9	110·3	110?
Dental (Flower)	44·8	?	?

w indicates a wormian bone.

CRANIOLOGICAL NOTES ON THE ABORIGINES OF TASMANIA.

THE rarity of the osteological remains of the aboriginal Tasmanians justifies the presentation of the following notes on the specimens in the Anatomical Museum at Cambridge. The specimens are five in number and a note as to their provenance is appended. They will be considered in the numerical order in which they appear in the Cambridge Catalogue.

The first specimen (figs. 1 and 2), numbered 2096, is a male[1] skull and fairly complete, though only fragments of teeth remain and the mandible is absent. The capacity is small (1130 c.c.); the breadth

Fig. 1. Skull of Tasmanian: norma verticalis.

index (73·9) places it in the dolichocephalic category, and the altitudinal index, being lower than the breadth index, confers on it the character of platycephaly. Of the other indices, the most interesting are the nasal

[1] The donor believed it to be a female skull, but there is but little doubt that this is not so, and the sex is almost certainly male.

(64·9), which indicates great relative breadth of the nasal aperture, and the stephano-zygomatic, which indicates that the specimen is highly phænozygous. Of the general characters of this skull, it remains to say that the glabellar prominence is extremely well marked, that the mastoid processes are small, the zygomatic arches slender, and other muscular ridges well marked. Synostosis is observed at the pterion on each side, the parietal and sphenoid bones articulating in this region. As regards the facial skeleton, the nasal bones have evidently been strongly upturned, as in the crania of aborigines of Australia. The overhanging brow-ridges give great apparent depth to the orbits, and the lacrymo-ethmoid suture is very short. When viewed in *norma basilaris*, the

Fig. 2. Skull of Tasmanian: norma lateralis.

palate is seen to be elliptical, the choanæ small, the pterygoid plates small, though allowance must be made for reduction through weathering; the tuber maxillare is not conspicuously large. An important point is the shallowness of the bony auditory meatus, which on one side is perforated. On one side the inferior petrosal sinus grooves deeply the side of the basi-occipital (the notch thus produced must not be confounded with the rare notch indicating a separation of the basi-occipital into anterior and posterior portions).

The next specimen, 2097, is a mandible belonging to an adolescent individual, inasmuch as the third molars have only just made their way

to the surface. It is noteworthy that although this mandible presents features characteristic of a lowly race in respect of the short ascending ramus and shallow notch, yet the chin is well developed. The genial tubercles are short, but quite distinct. The teeth are large, and, with the exception of the two second molars, in good preservation. Both the molars just mentioned show the effects of carious degeneration, which on the left side has led to an alveolar abscess, communicating by a fistulous opening with the buccal aspect of the maxilla. The socket of the first molar tooth on the same side seems also to have been the seat of a similar abscess, though of much smaller dimensions. The small size of the mandible when compared with the next specimen suggests that it is that of a female.

No. 2098 is likewise a mandible, probably that of a male, being much stouter than the last. It has been exposed to a considerable amount of weathering, and all the incisor and both canine teeth have been lost (*post mortem*). The chief points of interest are as follows:— The chin is prominent, though not so much so as in 2097. The genial tubercles are replaced by a low vertical ridge. The body of the mandible is massive, the ascending ramus short, and the sigmoid notch shallow. The molar teeth are large, and their crowns so divided as to present a pentacuspidate appearance in the case of the second and third, and probably of the first, although there does not remain enough of the crowns of these teeth to justify a more decided statement. This is quite possibly the mandible belonging to the following specimen.

No. 2099 is the fore part of a male skull and face without the mandible. The facial characters are so like those of the first described specimen (No. 2096) as to render further description superfluous. As regards the general characters of this skull (No. 2099), it will be found that the higher degree of prognathism (index 113·2) is accompanied by greater skull-breadth and stouter zygomatic arches than in No. 2096. The palate is larger and is elliptical, the auditory meatus remains on the left side only, and is shallow. The basi-occipital is notched by the inferior petrosal sinus, as was the case in No. 2096, but more deeply than in the latter. Within the cranium the interesting points to notice are: the strong impressions made by the frontal cerebral convolutions on the endocranial surface[1]; the small size of the crista galli and dorsum sellæ. The floccular fossa is small, and the borders of the foramina optica curiously thickened. The frontal and the temporal bones articulate at the pterion on each side.

Specimen No. 2100 is a calvaria, seemingly that of a male. Synostosis is far advanced, especially in the coronal suture, and is more

[1] Cf. Schwalbe: review by Laloy: *L'Anthropologie*, 1904.

pronounced endocranially than on the exterior of the skull. Two small wormian bones are seen at the lambda. On the right side, epipteric ossicles seem to have been present, but are almost indistinguishable. On the left side the squamous and frontal bones seem to have articulated at the pterion. The mastoid processes are very small, the auditory meatus shallow. Post-orbital frontal compression is marked; the calvaria is long and lozenge-shaped and its capacity small (1130 c.c.).

It is now possible to review the series as a whole, and the first point to notice is that out of three specimens available for observation two possess a fronto-squamous articulation in the region of the pterion. According to Turner (*Challenger* Reports, "Human Crania") this has not been hitherto recorded in crania of aborigines of Tasmania. It is further noteworthy that in the remaining specimen the appearances, though obscure owing to synostosis, denote that the spheno-parietal suture was very short. With regard to general appearances, the specimens resemble other crania of aboriginal Tasmanians, such as those described by De Quatrefages (*Crania Ethnica*). The most perfect specimen, viz. the example first described (2096), presents fairly typical features, which are evidently in most respects exaggerations of the characteristics of the crania of aboriginal Australians. Especially is this the case in regard to the following specific points, viz., capacity, post-orbital frontal compression, glabellar prominence, nasal bones (flat and upturned), width of nasal aperture, indefiniteness of the lower margins of that aperture (bothro-craspedote character), prognathism, macrodontism, smallness of mastoid processes, flatness of contour of squamous portion of temporal bone, channelling of the ali-sphenoids, shortness of the lacrymo-ethmoidal suture, presence of a rounded transverse occipital torus, and in the characters of scaphocephaly, phænozygism, and the possession of the lozenge-shaped outline in norma verticalis. But there remains at least one craniological difference to notice. The Tasmanians have not quite such elongated skulls as the neighbouring aborigines of Australia. The difference is noteworthy, and is possibly associated with the smaller average size of the Tasmanian aboriginal, for it is the exception to find a high degree of dolichocephaly among the dwarf races. On the whole, however, judged by their cranial characters, the affinities of the Tasmanian aborigines are evidently with the aborigines of the neighbouring island-continent, rather than with any other race, and in these characters no striking resemblances to any of the dwarf races are demonstrable.

The foregoing statements will give some idea of the characteristic features of the crania of Tasmanian aborigines in the Cambridge Museum. The following notes are descriptive of the provenance of the

specimens, and a table of measurements is appended. Two of the specimens, No. 2096 and the mandible 2098, have been photographed. The mandible is approximately of the same dimensions as regards breadth as that of No. 2096, and the photograph was reproduced in the *Journal of Anatomy and Physiology*, vol. xxxiv. (*Proc. Anat. Soc.*).

Two photographs are appended to the present account, viz., figs. 1 and 2, representing the specimen 2096 in norma verticalis (fig. 1) and in norma lateralis (fig. 2) respectively. The numbers are those of the Cambridge Catalogue.

No. 2096. Skull of Tasmanian; from Mr T. Anford, Tasmania, 1845, per the Rev. H. G. Tomkins. Mr Anford believed it to be the skull of a female.

No. 2097. Presented by James Bonwick, Esq., with specimen No. 2100.

No. 2098. No reference; it was with No. 2096, to which, however, it does not belong.

No. 2099. Bears a card on which is written:

"Mr Chas. Harrison (?), Sudbury, from Mr Edmund Abbott,"
and on the reverse: "Port L.........."

No. 2100. Skull of Tasmanian; presented by James Bonwick, Esq.

DIMENSIONS OF SKULLS OF ABORIGINES OF TASMANIA
(*Cambridge University Collection*).

No. of skull	2099	2096	2100
Sex	Male	Male	Male?
Age	Adult	Adult	Aged
Cubic capacity	?	1130	1130 (app.)
Maximum length	?	180	180
Ophryo-occipital length	?	174	177
Ophryo-iniac length	?	172	177
Occipito-spinal length	?	184	?
Occipito-alveolar length	?	192	?
Maximum breadth	?	133 (p.)	130 (p.)
Bi-asterial breadth	?	109	105
Bi-auricular breadth	112	118	118
Bi-stephanic breadth	107	100	96?
Minimum frontal breadth	92	84	88
External bi-orbital breadth	104	103	105?
Minimum inter-orbital breadth	24	25	24
Jugo-nasal breadth	93	94	?
Bi-malar breadth	110	108	?
Bi-zygomatic breadth	?	124	?
Bi-maxillary breadth	85	87	?
Ophryo-mental length	129?	?	?
Ophryo-alveolar length	82	87	?
Nasi-mental length	102	?	?
Nasi-alveolar length	58	58	?
Basi-mental length	110	?	?
Basi-alveolar length	103	98	?
Basi-nasal length	91	95	?
Basi-bregmatic length	123	123	?

TABLE—*continued.*

No. of skull	2099	2096	2100
Sex	Male	Male	Male ?
Age	Adult	Adult	Aged
Basion to obelion, length	?	118	?
Basion to lambda, length	?	107	?
Basi-iniac length	?	81	?
Basion to opisthion, length	?	37	?
Breadth of foramen magnum	28	28	?
Orbital height	29	29	?
Orbital breadth	38	37	
Nasal height	41	37	
Nasal breadth	26	24	
Palato-maxillary length	60	51	
Palato-maxillary breadth	63	63	?
Horizontal circumference	?	499	502
Supra-auricular arc	290	282	285
Oblique parietal arc	?	347	340
Frontal arc	125	124	124
Parietal arc	?	121	128
Occipital arc (superior)	?	56	55
Occipital arc (inferior)	?	50	?
Jugo-nasal arc	103	104	?

LOWER JAW: No. ...	2098	2097	
Symphysial height	31	22	
Coronoid height	52	51	
Condylar height	55	50	
Gonio-symphysial length	77	70	
Intergonial breadth	95	80	
Intercoronoid breadth	85	84	
Intercondylar breadth (exterior)	105	103	
Intercondylar breadth (interior)	67	71	
Breadth of ascending ramus	34	31	
Angle of ascending ramus	108°	114°	

	2099	2096	2100
Indices:			
Cephalic	?	73·9	72·3
Vertical	?	68·4	?
Alveolar	113·2	103·15	?
Orbital	76·3	78·4	?
Nasal	63·4	64·9	?
Palato-maxillary	105	123·5	
Superior facial (Broca)	?	70·2	?
Superior facial (Kollmann)	?	46·8	?
Stephano-zygomatic	?	80·6	?
Naso-malar	110·75	110·6	?

THE CRANIOLOGY OF THE NATIVES OF ROTUMA.

(With assistance from A. E. TAYLOR, M.A., Downing College, Cambridge.)

I. *Introductory.*

A COLLECTION of human crania was made by J. S. Gardiner, M.A., Fellow of Gonville and Caius College, Cambridge, on the occasion of his visit to Rotuma in 1897. Of the history of that island, and of the appearance, customs, and traditions of its inhabitants, Mr Gardiner has given a very complete account, which was published *in extenso* in the *Journal of the Anthropological Institute* (vol. xxvii, June—October, 1898).

The present account of the human crania consists of a general description of the specimens, followed by a discussion of the conclusions to be drawn from this study; finally, detailed descriptions of the individual specimens, together with some numerical data, are appended.

The crania are nine in number, and from their general appearance, they would appear to have lain partially covered by a very dry sandy soil; in consequence of which the gelatinous constituents of the bony tissue have been largely removed, leaving the specimens in a brittle and fragile state. Some of the specimens show signs of weathering. Six crania are fairly complete with mandibles; there are two incomplete crania from which the facial bones and mandibles are missing, and there is a single calvaria. All the skulls are adult; and, in all, the facial bones have suffered more damage than those of the cranial vault. With two exceptions the skulls are those of males; there is one skull (1817) which is probably, but not certainly, male, and there is one female skull (1811).

II. *General Results.*

Excluding the female skull (1811), the specimens fall into three groups, as follows:—

(α) Typical Polynesian of the western variety. The qualifying adjective *western* is found to be necessary, inasmuch as the researches of De Quatrefages and Hamy show that the Western and Eastern Polynesians are to be contrasted in respect of cranial type. In the following notes, the term Polynesian is to be taken as signifying Western Polynesian, and indeed the Western Polynesian is to be regarded as the Polynesian *par excellence* in respect of skull-form. The specimens of Polynesian aspect are the following:—Nos. 1809, 1813, 1814, 1815, 1816, 1817. It must be mentioned that the cephalic index ranges in this series from 71 to 86·5.

(β) Typical Melanesian; represented by a single specimen, viz., No. 1812. (See fig. 1, on p. 154 below.)

(γ) A form intermediate between the two preceding types, partaking of characters distinctive of both Polynesian and Melanesian crania; a single specimen, No. 1810, figures in this group, to which the female skull, No. 1811, is more nearly allied than to either of the foregoing.

The indication of craniology is thus that the island is inhabited by people of the tall brown-skinned Polynesian type, and also by individuals of the shorter and much darker-skinned Melanesian type, as well as by individuals possessing physical characters (such as stature, skin-colour, hair-colour, form of the hair, and the like) intermediate between those of the two foregoing stocks.

Since Rotuma is so situated geographically as to render it accessible to either Polynesians or Melanesians, such a combination of cranial forms is what one would have expected *à priori* to find among its inhabitants. It is now appropriate to adduce some evidence from the proportions of the crania, in support of the foregoing statements as to the way in which they may be classified. For this purpose several tables have been drawn up, the first of which shows that from the consideration of several of the principal indices, the differences previously mentioned are fully corroborated. In Table A. the most striking contrasts are seen between the indices of the chief averages as obtained from the skulls No. 1809, 1813, 1814, 1815, 1816, 1817, on the one hand, and the skull No. 1812 on the other. For this reason the former skulls have been associated in a single group (α), while the latter (No. 1812) is regarded as a representative of a second group (β).

TABLE A.

	Index from the averages for 1809, etc.	1812	1810
Breadth index... ...	80	71	74·6
Height index	77·5	73·2	—
Alveolar index... ...	98·1	105	—
Orbital index	84·5	80·9	95·1
Nasal index	46·7(?)	55	46
Palato-maxillary index	109·8	110·3	116·4
Naso-malar index ...	105·4	109	108·4
Cubical capacity ...	1552	1405	1310
Group	α "Polynesian"	β "Melanesian"	γ "Intermediate"

TABLE B.

	Average for Rotuma skulls considered to resemble the Polynesian type	Average for Polynesian crania examined by Flower and Topinard	Rotuma skull considered to be of Melanesian type	Averages for Melanesian crania from Flower and Topinard
Breadth index	80	79·7	71	71·4
Height index	77·5	75·5	73·2	74·9
Alveolar index ...	98·1	98·6	105	103·4
Orbital index	84·5	91·6	80·9	80·6
Nasal index	46·7 (?)	47·9	55	55·6
Palato-maxillary index	109·8	?	110·3	?
Naso-malar index ...	105·4	?	109	?
Cubic capacity ...	1552	1525 (Deniker)	1405	1460 (Deniker)
Group	α		β	

The specimen No. 1810 will be seen to occupy an intermediate position inclining in some respects to group (α) and in others to group (β).

In the next place it is necessary to show that of the two groups just described, the first (α) may definitely be recognized as approximating to the Polynesian, and the other (β) to the Melanesian type form. With this aim in view, Table B. was drawn up, and is next to be considered. A glance at the figures will establish the correctness of the proposition that among the Rotuma crania a Polynesian group and a Melanesian specimen are present.

That Rotuma is liable to be visited by Polynesians and by Melanesians is not only a matter of surmise from the consideration of its geographical situation, but is also evidenced by the information collected by Mr Gardiner (*loc. cit.*, reprint, pp. 4 *et seq.*), which shows that the inhabitants do actually vary in appearance to a considerable extent, the majority, however, resembling men of the Polynesian type, the Melanesian element being apparently subordinate in amount. Mr Gardiner records that the Rotuman legends mention the advent of visitors from Tonga, Samoa, and Niuafoou, but naturally reliable historical evidence on the subject of the peopling of the island is scanty in the extreme. It is noteworthy that Mr Gardiner mentions that while Polynesian or Micronesian strangers might be adopted through marriage into a Rotuman family, Fijians and Melanesians on the contrary were always treated as inferiors, and when dead their remains were buried on some islet on the reef, apart, that is, from the Rotuman burial-places. Linguistically the affinities of the Rotuma natives are with the Samoans, who may be taken as representing the Polynesian type, rather than with the Fijians, who represent a Melanesian stock.

From the foregoing considerations it will be seen that the evidence of craniology is in accord with that furnished by the external appearance, the traditions, customs, and language of the natives of Rotuma. There remain two points for discussion in connection with this part of the study of the natives of Rotuma. In the first place, the proximity of Rotuma to the Micronesian area suggests the possibility of the presence of what might be referred to as a Micronesian constituent in the population of the island. This is a subject hard to deal with craniologically, because there has not yet been established satisfactorily in the Micronesian area a cranial form sufficiently constant to justify its description as a type-form. Indeed, so far as the researches of one of us go, Micronesian skulls are more closely matched by a skull from Easter Island (separated by the whole breadth of the Pacific Ocean) than any others from the more immediate vicinity of that island-group. There is consequently but one observation to be recorded in this

connection. One might expect, in the Micronesian area, the occurrence of skulls with Mongoloid features, inasmuch as the islands of Micronesia have been subject to immigration, on a fairly considerable scale, from the Asiatic mainland. The fact, then, that the Rotuman skull, No. 1814, though of the Polynesian type, also presents the Mongolian characteristic of large and widely divergent malar bones, is worthy of mention in this connection.

The other point remaining for consideration is the inquiry whether one should look for other cranial morphological types beyond those already mentioned. In this connection, too, there is but one fact to record, viz., that the Rotuman specimen, No. 1815, is, superficially at least, very similar to a skull from Vancouver Island, now in the Cambridge Collection. No stress need be laid on this observation, however, beyond the remark that, after all, the form of the skull, even in the most isolated communities where the character has become almost stereotyped, is liable to occasional varieties departing far from the usual form, and that in a case where two skulls from widely separated localities are compared, it is of course possible that either specimen may constitute an abnormality. In conclusion, then, no elements beyond the Polynesian and Melanesian can be distinctly demonstrated to exist in the population of Rotuma, when one is confined to the evidence afforded by this collection of skulls.

III. *Detailed Descriptions of the Crania.*

The individual specimens will now be described in the numerical order of the catalogue of the Cambridge Anatomical Museum.

1809. This specimen consists of the bones of the cranial vault with the two temporal bones; the facial skeleton, including the mandible, being absent. The sex was male.

The general form in norma verticalis is brachycephalic (breadth-index = 81). The maximum breadth occurs in the region of the parietal eminences. Synostosis has commenced in the sagittal suture, at each extremity of which it has advanced further than in the intermediate portion. The parietal foramina are inconspicuous.

In norma lateralis, massive supra-orbital ridges are very noticeable; hereby the length of the skull is considerably augmented. Examination of the curve of the cranial vault leads to the observation that flattening is marked from the junction of the middle and posterior thirds of the sagittal suture onwards, being continued beyond the lambda. The external occipital protuberance is moderately prominent. The mastoid

processes are massive and much prolonged downwards. At each asterion there have been wormian ossicles. On the posterior part of the frontal and on the parietal bones, the temporal ridges are reduplicated. At the pterion, the parietal and great wing of the sphenoid articulate with one another.

In norma facialis, the massive brow-ridges again attract attention. In comparison with the inter-parietal breadth (which is the maximum width of the skull) the frontal width seems unusually small. The maximum breadth occurs at a level far above the bases of the mastoid processes. The vertical height of the skull is great, though actually it is exceeded by the figure representing the maximum transverse diameter.

In norma basilaris, the following points are to be noticed:—The glenoid fossæ are of moderate depth only; the occipital condyles are somewhat asymmetrical in position as regards the margin of the foramen magnum; the endocranium presents no features of special interest.

In norma occipitalis, the form of the skull is pentagonal, and, as has been noted, the maximum breadth is found at the parietal eminences, from which level the lateral parietes converge so that the inter-mastoid diameter is relatively small. Distinct asymmetry in the positions of the occipital condyles is again noticeable; that of the left side descending to a lower level than its fellow of the right side, so that a slight degree of plagiocephaly is produced.

1810. A male skull, the base of which has been to some extent destroyed; the basilar portion of the occipital bone is imperfect; the nasal bones and ethmoid are also incomplete, so that the internal orbital walls are imperfect.

In norma verticalis, the general form of the skull is oval. The cephalic index places it in the dolichocephalic class (index 74·6); it is also phænozygous; synostosis is seen in the sagittal suture, and the skull presents a ridge-like elevation along the line of this suture; there are two small parietal foramina.

In norma lateralis, the brow-ridges are massive and prominent, the face prognathous, the temporal ridges well marked, and the mastoid processes large. A ridge marks the line of articulation of the sphenoid and temporal bones, and the coronal suture is synostosed near the pterion, where the sphenoid and parietal bones meet.

In norma facialis, the brow-ridges and zygomatic arches are again noticed as being massive. A depression, seen above the left external angular process on the frontal bone, indicates probably that injury had been sustained here through a blow.

The frontal bone shows post-orbital compression and is, generally

speaking, developed to an extent small in comparison with that of the other cranial components. The orbits are shallow with very oblique roofs, and the lachrymal fossæ are particularly shallow. The nasal aperture is long and narrow, and the remnants of the nasal bones suggest that these were also long, narrow, and not very prominent. Sub-nasal fossæ are distinct (amblycraspedote character).

In norma basilaris, the teeth are seen to be large and not much worn. The palate has a parabolic outline. There are large infra-temporal crests, long styloid processes, deep glenoid fossæ, and prominent mastoid processes.

In norma occipitalis, the skull appears scaphoid. The external occipital protuberance is inconspicuous, but there is a well developed transverse occipital torus. At the right asterion is a small wormian bone.

Large Pacchionian depressions mark the endocranium. The angle of the mandible is small, being nearly 90°.

1811. A female skull with the mandible in fairly good preservation; the ethmoid bone and septum nasi are, however, much damaged.

In norma verticalis, the skull is of moderate length (it is mesaticephalic); the parietal eminences are well developed; there are two parietal foramina; the principal sutures are unclosed.

In norma lateralis, prognathism is very marked, especially the sub-nasal variety of the character; the frontal region is not full, the muscular crests, brow-ridges, and mastoid processes are feebly developed. The sphenoid and parietal bones articulate on either side: there are wormian bones in the lambdoid suture. The curve of the cranial vault runs fairly uninterruptedly from nasion to opisthion; slight flattening occurs at the bregma, and again between the obelion and the lambda, the latter flattening contributing to the formation of a slight but distinct occipital *renflement*; the inion is not prominent, nor are the occipital crests large.

A small fissure indicative of a suture dividing the malar bone horizontally is observed to start from the temporo-malar junction on either side. On the left side a variety of the pterygo-spinous foramen is seen.

In norma facialis, the orbits are rather low, with deep lachrymal depressions: the apertura pyriformis nasi is wide, with large, deep pre-nasal fossæ, of the type so frequent in Polynesian crania (cf. Macalister, *Journal of Anatomy and Physiology*, Jan., 1898). The nasal bones are wide and flat.

In norma basilaris, the palate is seen to have a parabolic contour; the condyles are placed slightly asymmetrically on the margin of the foramen magnum.

In norma occipitalis, the outline is pentagonal with very distinct flattened areas above and below the parietal eminences. A wormian bone is seen at the lambda. The angle of the mandible is nearly 90°; the coronoid processes large and higher than the condyles; the sigmoid notch is shallow.

Female characteristics are well marked in this specimen.

1812. A male skull with the mandible; the zygomatic arches and the condyles of the mandible are broken; the bones of the cranial vault show evidence of weathering. Before proceeding to the detailed

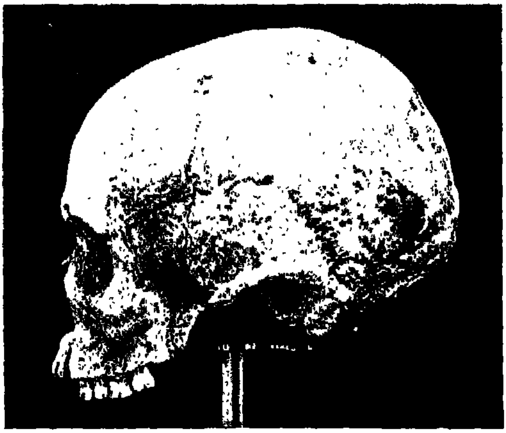


Fig. 1. Skull No. 1812. Melanesian type.

description, it may be remarked at once that this skull is in many respects typically Melanesian; at the same time, it closely resembles a skull in the Cambridge Collection labelled "Skull of a Bushman chief" (to which a similar description applies, and which is therefore not a typical Bush skull).

In norma verticalis, great elongation is noticed (the cephalic index is 71). The skull is phænozygous; there is marked post-orbital frontal compression; the sutures are complex, and in the left half of the coronal suture is a long narrow wormian bone.

In norma lateralis, the glabella and brow-ridges are prominent; a moderate degree of prognathism is observed. The external occipital protuberance is large, but the mastoid processes of moderate size only. The sphenoid and parietal bones articulate on either side, and at each asterion is a wormian bone. The spheno-palatine foramen is very large on each side and is visible from the spheno-maxillary fossa.

In norma facialis, shallow wide orbits with bevelled outer margins are seen; the lachrymal fossæ are deep. On each side the maxilla and sphenoid cut off the malar from the spheno-maxillary fissure. The nasal bones are short and upturned, wider below than above; the apertura pyriformis nasi is wide, with indistinct lower margin.

In norma basilaris, the palate appears parabolic in outline; the glenoid fossæ are of moderate depth. On the right side the foramina spinosum and ovale are confluent with each other and with the petro-sphenoidal fissure.

In norma occipitalis, the outline is pentagonal; small parietal foramina are seen.

The mandible is massive, the angle large, and there is a depression in front of the gonion. The molar teeth decrease in size from before backwards.

1813. A male skull of very great size. The specimen is in good preservation; the mandible accompanies it; parts of the inner walls of the orbits have been destroyed.

In norma verticalis, the form is elongated; on either side of the sagittal suture is an area of flattening which gives rise to a slightly keeled appearance. No parietal foramina are present. The temporal ridges are rather tortuous.

In norma lateralis, prognathism is distinct; the supra-orbital ridges and the external occipital protuberance are large and massive. The frontal bone recedes rapidly from the glabella, and the median sagittal arc of the cranium is regular except near the lambda, where the conformation is slightly bathrocephalic, the appearance being the more pronounced in consequence of the massive transverse torus crossing the occipital bone. The coronal suture is synostosed on the right side just above the pterion; on both sides the sphenoid and parietal bones articulate in this region. The temporal ridges are well marked; at the right asterion is a wormian bone.

In norma facialis, the orbital apertures are seen to be high and their margins bevelled; the apertura pyriformis nasi is of moderate width, the lower margins being indistinct; the nasal bones are large.

In norma basilaris, a hypsiloid palate is seen; the teeth are slightly worn down, the molars decreasing in size from before backwards; the first molars of the upper jaw have four cusps, of the lower have five cusps, the second molars resemble the first as regards the number of cusps, the third molars of the upper jaw have three cusps, and their *vis-à-vis* in the mandible five cusps. The teeth on the left side of the mandible are irregularly placed. The very great capacity of this cranium is to be specially noted. It is allied to the Polynesian type,

but also resembles certain crania from North America in the Cambridge Museum.

1814 (fig. 2). A large and almost perfect male skull with mandible; there are several perforations, probably due to injury incurred in exhumation. The great prominence of all crests and ridges giving attachment to muscles indicates the great physical development of the individual.

Fig. 2. Skull No. 1814. Norma lateralis.

In norma verticalis, the skull is of moderate length; the sagittal suture is closed at the obelion, and no parietal foramina are present.

In norma lateralis, the skull appears moderately prognathous, the prominence and massive character of the brow-ridges, external occipital protuberance, mastoid processes, and zygomatic arches are marked. The frontal bone retreats somewhat rapidly from the glabella backwards, there is no flattening at the bregma, and the median sagittal arc is regular as far as the lambda, where a slight tendency to bathrocephaly is noticed. The sphenoid and parietal bones articulate at each pterion near which the coronal suture is closed. At each asterion is a wormian bone. As regards the facial bones, the profile is flattened.

A peculiar condition exists at the upper portion of each mastoid process (fig. 3). The temporal ridge traverses the parietal bone and descends to the lambdoid suture, where the parietal bone is thickened and overlaps the occipital, passing backwards over it like a sort of operculum. But the temporal crest now running forwards is not

confluent with the posterior zygomatic root on the temporal bone, for it is separated from that ridge by a deep fissure running obliquely upwards, to end in the squamo-parietal suture; this fissure is in turn

Fig. 3. Skull No. 1814. Showing curious ridges near asterion.

overlapped by a thickening of its anterior lip, which is continuous with the posterior root of the zygoma. In the absence of evidence to the contrary, it is suggested that the fissure separating the temporal ridge and the posterior root of the zygoma represents the original line of demarcation between the squamous and mastoid (*i.e.*, petromastoid) elements of the temporal bone. Traces of a similar arrangement appear in No. 1813.

In norma facialis, a depression, probably the relic of a wound, is seen over the left orbit; the orbits are shallow, with high orifices, and bevelled orbital margins; the nasal bones are small and narrow. The apertura pyriformis is wide and has well-marked sub-nasal fossæ. On the left side is a small bony tubercle on the lower margin of the nasal aperture. There is a slight post-orbital compression of the frontal bone. The canine fossæ are practically non-existent, and this combines with the much splayed and massive malar bones to confer on the countenance a decidedly Mongolian cast.

In norma basilaris, an hypsiloid palate is seen; the glenoid fossæ are deep, the zygomatic arches outstanding. On the left side is a double pterygo-spinous foramen. The great development of the ridges on the occipital bone reminds one of the corresponding region in the gorilla, especially of immature specimens.

Fig. 4. Skull No. 1814. Showing the horizontal line of the skull.

In norma occipitalis, the chief features are the extraordinarily prominent occipital ridges and crests.

The mandible is massive, the coronoid processes being higher than the condyles; a deep notch is seen in front of the gonion. The symphysion is prominent. Some crenation is seen on the surface of the crowns of the molar teeth.

1815. A male skull with mandible; much of the facial skeleton is absent; muscular ridges and processes are moderately well-marked. There is a slight degree of prognathism.

In norma verticalis the form is oval but posteriorly truncated; the skull is of moderate length and cryptozygous; synostosis is seen in the sagittal suture from the obelion to the lambda; there are very small parietal foramina; on either side of the sagittal suture is an area of flattening.

In norma lateralis, the chief feature is the prominence and high development of brow-ridges, external occipital protuberance, mastoid processes, temporal ridges, and other bony crests. On each side the sphenoid and parietal bones meet at the pterion, near which the coronal suture is closed. The frontal bone retreats rapidly from the ophryon, but the median sagittal arc is regular till interrupted by a slight bulging

of the occipital bone beyond the external occipital protuberance. At the left asterion is a wormian bone, and there is a slight exostosis behind and below the left parietal eminence. The occipital condyles are very prominent; and on the left side the middle meningeal artery threw out an external branch.

In norma facialis, the orbits are seen to be shallow and wide; the lachrymal fossæ are deep; orbital margins are sharp; the remains of the nasal bones are sharply upturned.

In norma basilaris, the only point to notice is the depth of the glenoid fossæ.

In norma occipitalis, the outline is pentagonal, and synostosis of the lambdoid suture is noticed near the lambda.

In the mandible the angle is large, the coronoid processes are higher than the condyles; the chin is prominent; anteriorly to the gonion is a well-marked notch.

The teeth show slight crenation; the third molars are the smallest, and these and the first molars are pentacuspidate, the second molars are tetracuspidate.

1816. A calvaria of the male sex. In norma verticalis, the contour is obovate and brachycephalic, with slight post-orbital frontal compression; the right half of the coronal suture is closed, the left half being closed near the pterion; the sagittal suture is tortuous and synostosed at the obelion. As regards the endocranium, synostosis is almost complete, showing that this process commences and is completed earlier on this surface than on the exterior of the skull. There is one parietal foramen (the left). The calvaria is much broader below the parietal eminences, but this appearance may be due to posthumous deformation or pressure.

In norma lateralis, the brow-ridges are moderately prominent; the external occipital protuberance of similar development; the median sagittal arc is regular. The same description applies to the transverse arc as seen in norma occipitalis.

1817. A much damaged skull of which it is hard to determine the sex, which is probably male. The facial skeleton is absent, as is also the mandible and much of the base on the right side. The cranium is large, with but moderately marked prominences and muscular ridges.

In norma verticalis, the outline is ovoid, with outstanding parietal eminences; brow-ridges are not prominent. There are no parietal foramina; the sutures are not tortuous. It is particularly noteworthy that there is considerable asymmetry (plagiocephaly), flattening on the right side being accompanied by corresponding bulging outwards on the left.

TABLE C. ROTUMA SKULLS.

Anatomical character	1809	1810	1811	1812	1813	1814	1815	1816	1817
1. Character of lower nasal margins	?	Spine distinct; margins indistinct, with small fossæ	Deep fossæ; bothrocraspedote variety	Margins indistinct, no fossæ	Margins indistinct, no fossæ	Fossæ are distinct but not large, spine broken	?	?	?
2. Infra-orbital suture, pars facialis	Closed	Closed	Present R. and L.	Closed	Closed	Present	?	?	?
3. Post-palatine spine	Absent	Absent	Blunt; trace of a notch	Sharp	Sharp	Blunt	?	?	?
4. Divided malar bone	Not seen	Not seen	Trace of suture R. and L.	?	Not seen	Not seen	Not seen	?	?
5. Lachrymo-ethmoidal suture ...	?	?	?	Present R. and L. and long	?	Present R. and L. and long	?	?	?
6. Conformation in region of pterion ... ... R. ...	Parietal; Sphenoid	Parietal; Sphenoid	Parietal; Sphenoid	Parietal; Sphenoid	Parietal; Sphenoid	Parietal; Sphenoid	Parietal; Sphenoid	?	Parietal; Sphenoid
L. ...	?	Parietal sphenoid	Parietal sphenoid	Parietal sphenoid	Parietal sphenoid	?	Parietal sphenoid	?	Parietal sphenoid
7. Palatine torus	?	?	None	None	None	Ridge, no torus	?	?	?
8. Pterygo-spinous foramen ...	?	Absent R. and L.	Present on L.	Absent R. and L.	Absent R. and L.	Absent R. and L.	Absent R. and L.	?	Absent L. ? R.
9. Margin of foramen magnum ...	Tubercle on anterior margin	?	?	Normal	Normal, but large foramen	Normal	Normal	?	Normal

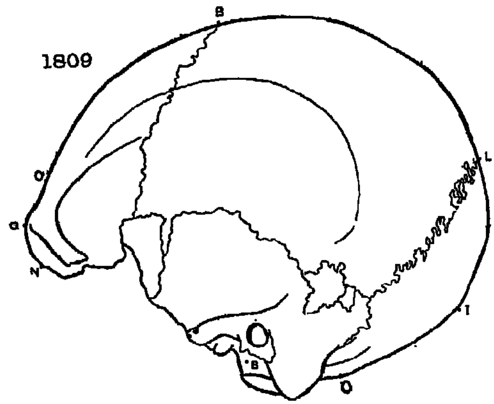
From the foregoing table it appears that—
(1) The lower nasal margins are commonly indistinct, though never entirely obliterated, and that fossæ of the type so common in Polynesian crania are here met with.
(2) That the pars facialis of the infra-orbital suture is rare.
(3) That the post-palatine spine is commonly sharp, not bifid.
(4) That division of the malar bone (os japonicum) is rare.
(5) That the lachrymo-ethmoidal suture is normal, and that it is long.
(6) That the parietal and sphenoid bones commonly meet at the pterion.
(7) That a palatine torus is rare.
(8) That the pterygo-spinous foramen is rare.
(9) That tubercles on the anterior margin of the foramen magnum are rare.

TABLE D. SKULLS FROM ROTUMA.

Measurements	1809	1810	1811	1812	1813	1814	1815	1816	1817
Maximum length	189	185	172	183	203	187	193	178	176
Ophryo-iniac length ...	175	175	169	178	191	185	186	176	173
Maximum breadth ...	149	137	131	130	150	148	148	154	149
Bi-auricular breadth ...	?114	120	107	115	118	132	123	?	124
Bi-stephanic breadth ...	114	94	104	106	115	122	123	114	?
Bi-zygomatic breadth ...	?	136	121	?128	? 140	148	?	?	?
Basion to nasion	?97	?	97	96	111	110	111	?	97
Basion to prosthion ...	?	?	97	101	105	? 115	?	?	?
Basion to bregma	142	?	132	134	147	147	149	?	140
Basion to lambda	120	?	115	117	133	? 123	130	?	118
Basion to inion	87	?	81	84	94	90	90	?	79
Basion to opisthion ...	34	?	34	34	42	37	40	?	35
Orbit: height	?	39	33	34	? 41	38	38	?	?
„ breadth	?	41	41	42	? 47	46	44	?	?
Ap. py. nasi: height ...	?	63	48	51	? 58	? 62	?	?	?
„ „ breadth ...	?	29	30	28	? 27	29	?	?	?
Pal. max.: length ...	?	55	52	58	61	? 59	?	?	?
„ breadth ...	?	64	62	64	? 60	67	?	?	?
Jugo-nasal arc	?	105	102	110	124	120	?	?	?
Jugo-nasal width	?	97	94	101	? 112	110	?	?	?
Dental series	?	? 43	? 38	? 43	50	?	?	?	?
Horizontal circumference...	518	509	483	507	555	534	540	523	522
Nasi-alveolar height ...	?	82	65	69	? 74	80	?	?	?
Bi-gonial breadth	?	103	99	103	102	116	102	?	?
Indices.									
Cephalic	80·9	74·6	76·1	71	73·9	79·1	76·7	86·5	84·6
Height	77·8	?	76·7	73·2	72·4	78·6	77·2	?	79·5
Alveolar	?	?	100	105	?	104·5(?)	?	?	?
Orbital	?	95·1	80·5	80·9	87·2(?)	82·6	77·3	?	?
Nasal	?	46	62·5	55	46·5(?)	46·8(?)	?	?	?
Palato-maxillary	?	116·4	119·2	110·3	98·3(?)	113·6(?)	?	?	?
Naso-malar...	?	108·2	108·5	109	101·8	110	?	?	?
Cubic capacity	*Circa* 1550	1450	1315	1405	1720	1600	1695	*Circa* 1550	1530

In norma lateralis, no marked prominence of brow-ridges or other muscular ridges or processes is to be observed. At each pterion the sphenoid and parietal bones seem to have come into contact, but there is now synostosis of the coronal suture in this region. The frontal bone rises fairly steeply from the ophryon, and the median sagittal arc is regular, with slight elevation at the bregma and slight sub-iniac bulging of the occipital bone; at each asterion is a wormian bone.

In norma basilaris, the only point to notice is the shallowness of the glenoid fossa.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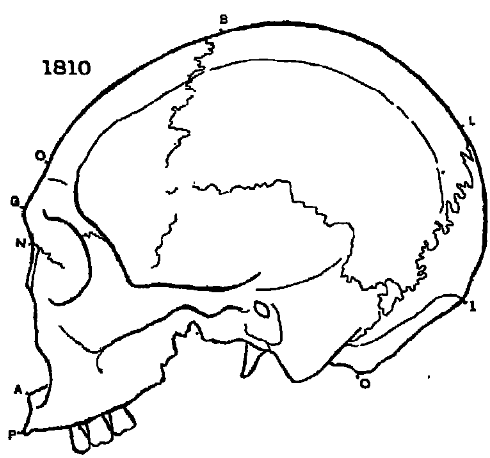
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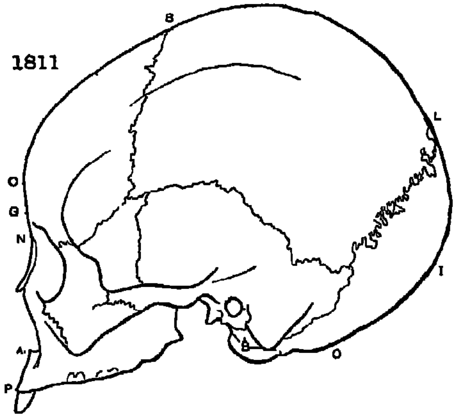
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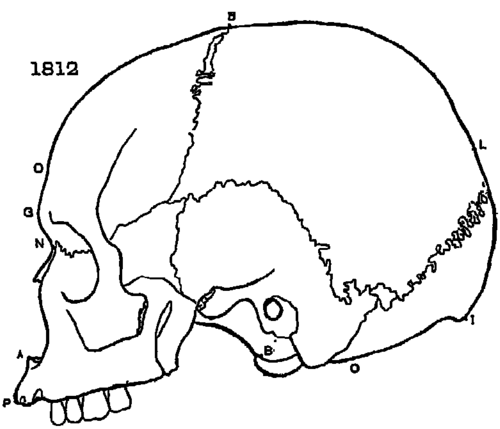
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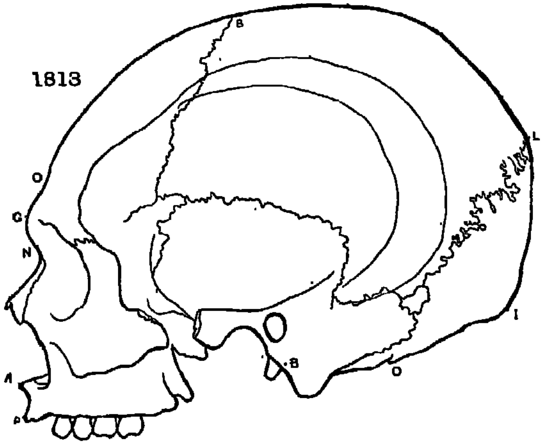
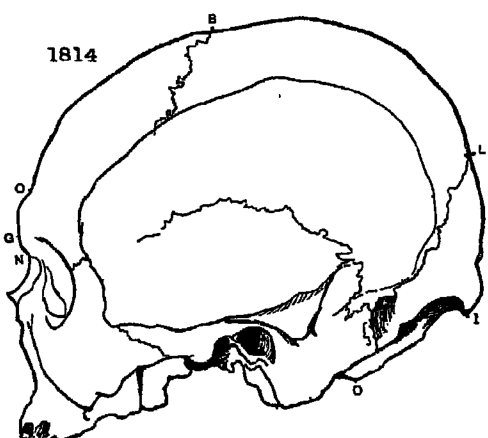
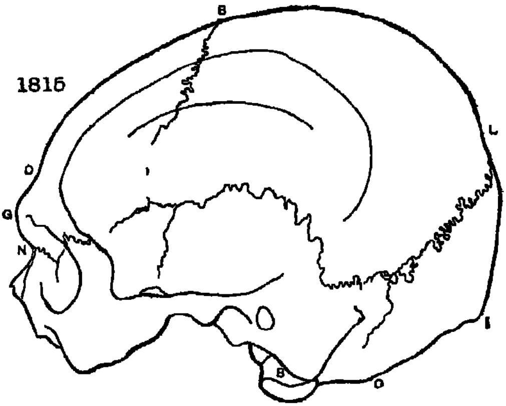
1813



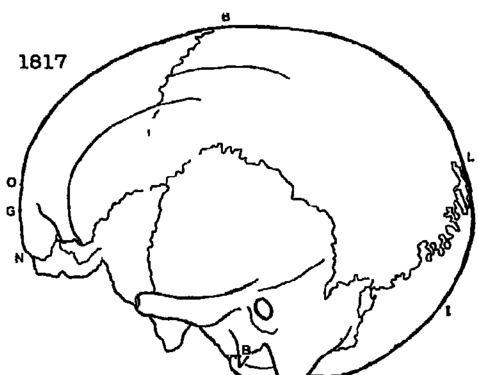
1814



1815



1817



In norma occipitalis, the form is pentagonal in outline; the maximum breadth is found in the mastoid region; in addition to wormian bones at each asterion, there are two others of larger size in the lambdoid suture. The inion is not prominent; there is a small exostosis on the right parietal eminence.

List of Tables.

Figures on pp. 162 *to* 165 *inclusive.*

Figures in the Text.

ON A COLLECTION OF CRANIA, WITH TWO SKELETONS, OF THE MORI-ORI, OR ABORIGINES OF THE CHATHAM ISLANDS. WITH A NOTE ON SOME CRANIA FROM THE SAME ISLANDS NOW IN THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.

THE following notes are descriptive of ten crania, with two skeletons, which have been recently added to the Anatomical Collection at Cambridge. The only information that is available respecting their provenance is to the effect that they were sent to this country by Mr H. A. Travers, of Wellington, New Zealand. Mr Travers's collection is mentioned by Professor Turner in the *Challenger* reports, and it is believed that the specimens now under consideration are certainly genuine. Eight appear to be male skulls, and two (with the skeletons) are probably those of females.

The description will fall into two subdivisions, in the first of which the most important characters of the specimens will be enumerated; and this will be succeeded by a brief discussion on the degree of resemblance of the crania to those already treated of by others under the description of Mori-ori or Chatham Island skulls[1]. In the first place, whereas the members of this series of ten skulls are very generally alike, they agree particularly in presenting a combination of features much more suggestive of an affinity with a Polynesian than with a Melanesian physical type. Thus the breadth of the cranium is distinctly greater (relatively) and the parietal eminences are more outstanding than is the case in typical Melanesian crania; the cranial capacity, however, does not afford a means of discrimination, though it is slightly in excess of the average value obtained from Melanesian series, the crania being in fact of moderate size. A striking feature which they share with typical Polynesian crania is a rounding off of the angle of the mandible, whereby the estimation of the value of that character in

[1] Poll has recently (*Zeitschr. für Morph. und Anthrop.* Band v., Heft i.) published an exhaustive memoir on all the known skeletal remains of the Mori-ori.

degrees is rendered more difficult than usual. The glabellar prominence is in few cases well developed, and herein, again, the affinity is with crania of Polynesian rather than of Melanesian origin. Symmetrical flattening on either side of the sagittal suture gives rise to a very distinctly pentagonal appearance in norma occipitalis; this has already been recorded as a characteristic of a Mori-ori skull described by Hyrtl (quoted by Turner). There is no case of a fronto-squamous articulation at the pterion, although in several cases epipteric ossicles are seen.

Finally we may mention two classes of abnormalities, the first of which might be described as adaptive, though its real significance is not quite clear. It consists in a tendency, which is quite marked among these skulls, to the production of bony paracondylar processes on the occipital bone. In the second class the variations are pathological and consist in extreme attrition of the teeth together with a sort of dislocation, so that the surface of the roots comes into play in the alveolar plane. Many cases of alveolar abscess were indicated by the condition of the tooth sockets. And finally, the frequency of the ravages of osteo-arthritis in the bones of the skeleton is very marked; Dr H. A. Forbes, of Liverpool, confirms this observation from the inspection of skeletons actually in the Chatham Islands, and the skeleton of a Chatham Islander in the Dresden Anthropological Collection presents unequivocal evidence of the existence of this condition.

With the above exceptions, comparatively few abnormalities have to be noticed.

The following notes refer to the individual features of the several crania:—

No. 1. Skull of an adult female with nearly complete skeleton. General preservation good. Few teeth remain, and these are much worn down. At the root of the left upper median incisor is a cavity, looking as if a cyst or abscess had existed here. The only other remarkable point is the conformation of the occipito-atlantic joint, which presents a rare abnormality. Paracondylar processes are present on each side, and of such a size that they articulate laterally with the articular surfaces of the atlas. Moreover, on the right side, the tip of the paracondylar process articulates with the extremity of the transverse process of the atlas. The left styloid process is perforated at its base by a foramen in addition to the normal foramen styloideum. Many signs of osteo-arthritis are seen about the pelvis and the lumbar section of the vertebral column, rendering the measurements of the bodies of lumbar vertebræ of comparatively little value.

No. 2. Sex doubtful. Aged individual. Teeth much worn. Sagittal suture completely closed. Two parietal foramina. Small paracondylar processes present. Mastoid processes (especially the right) very small. Posterior palatine spine bifid.

No. 3. Large male skull. A good deal weathered. The teeth are much worn. On the margin of the foramen magnum there is situate anteriorly a depression (probably for articulation with the odontoid process of the axis). The carotid canals are imperfectly closed in at the apices of the petrous bones.

No. 4. Adolescent individual, probably a female. The third molars not yet evident. The sagittal suture is, however, almost completely closed by synostosis, but there is no trace of scaphocephaly. One large parietal foramen. The teeth are of excellent quality. On the anterior margin of the foramen magnum is a small pit, possibly for the reception of the tip of the odontoid process of the axis.

No. 5. Skull of an adult male. The teeth in good preservation. The nasal bones are extremely reduced in size, especially in breadth. Large wormian bones at the pterion on either side.

No. 6. Massive skull of an adult male. The mandible is thickened anteriorly to the ascending ramus so as to resemble the condition present in many mandibles of Eskimo. There are paracondylar processes, that on the right side being small. The occipital condyles throw out projections anteriorly (cf. Poirier, *Traité d'Anatomie humaine*, tome 1er, p. 384).

No. 7. Massive skull of an adult male. Teeth much worn down. The posterior palatine spine is bifid. The occipital condyles send forward processes on to the basilar process of the occipital bone.

No. 8. Skull of an aged male. Slightly weathered. Teeth much worn and signs of an abscess cavity conterminous with the antrum of Highmore on the right. There is also a cavity of doubtful nature in connection with the socket of the left upper median incisor. The posterior palatine spine is bifid. Large paracondylar process on the right side.

No. 9. Skull of an adult male. Weathered and platybasic. Most of facial skeleton destroyed. Many teeth lost. The chief features are the flattened areas on either side of the sagittal suture, the ruggedness of the temporal crests in that region, and the high degree of prominence of a well-marked transverse

occipital torus, the latter character resembling that described by Miklouko-Maclay in an Australian cranium (*Proc. Linn. Soc. N.S.W.*, vol. viii.).

No. 10. Skull of an adult female with complete skeleton. Teeth much worn. Cavity in connection with socket of left upper lateral incisor. Signs of alveolar abscesses in margins of mandible in the region of the molar teeth. The posterior palatine spine is bifid. There is a wormian bone (epipteric ossicle) at each pterion. Incipient development of paracondylar processes is observed.

We may now turn to the second portion of the present communication and herewith inquire how far these characters and dimensions accord with accounts previously published of genuine Mori-ori crania.

Of such accounts, that written by Professor Sir William Turner in the *Challenger* reports is of first-class importance, as constituting the earliest summary of the osteological characters of these Pacific Islanders. But not less important, owing to the quantity of material dealt with and the minuteness of the investigations by which it is characterised, is the work of Dr Scott, of Otago, on the osteology of the Maori and the Mori-ori (*Transactions of the New Zealand Institute*, vol. xxvi., 1893). In this exhaustive report the skulls of nearly fifty Mori-ori natives are described, and the resulting indices compared with those published earlier by Turner. The latter observer had at his disposal only about half the number of skulls mentioned in reference to Scott's work.

Most of the measurements made by Scott have been adopted in the present paper, and in consideration of the comparatively small number (ten) of the crania at Cambridge, comparisons will be herein instituted in the main with Scott's results, without bringing into line in every case the results of Turner unless there is a particular reason for so doing. As a matter of fact, we may sum up the matter by saying that the present crania differ in no important respects from those at the disposal of the above-mentioned authors, whose own accounts will be seen, from Scott's monograph, to be remarkably consistent. Finally, the study of the hitherto undescribed Mori-ori crania in the Museum of the Royal College of Surgeons tends to exactly the same conclusion.

For comparison of results, the table on p. 172 has been devised as the most convenient means of enabling the figures to be compared with the minimum of cross-references.

Adopting the order of arrangement followed by Scott, the cranial capacity will be the first subject of comparison. From the table it appears that in both series the average value for specimens of both

sexes would be designated as mesocephalic, but that when males alone are considered, the designation must be megacephalic in Scott's series and mesocephalic in the Cambridge collection. The difference, in the case of males alone, is not great (19 c.c.), and in the combined data for skulls of both sexes there is practically identity in the results. The range of variation is represented by the figure 395(10) in the Cambridge series, as against 365(29) for males and 465(38) for both sexes in Scott's records. Finally, the Cambridge series contains one specimen of exceptionally high capacity similar to those mentioned by Scott, as having been recorded by De Quatrefages and Hamy (average of three male skulls 1,600 c.c.); this specimen at Cambridge has a capacity of 1,685 c.c. (No. 3). The small number (two) of the female skulls at Cambridge scarcely justifies detailed comparison of the averages obtained from their measurements with the more extensive series recorded by Scott.

In the succeeding indices the agreement between the two sets of figures is quite remarkable; in three indices, viz. nasal, gnathic (alveolar), and palatomaxillary, the accordance would have been probably even greater than is actually the case were it not for the weathering of the bones, which has for one of its results to render accurate measurements unusually hard to obtain. At the same time, the difference might almost be accounted for by the difference in number of the specimens. Such agreement affords strong evidence in favour of the authenticity of the Cambridge specimens.

One or two indices and measurements mentioned by Scott have not been included in the table, and are more conveniently referred to here. In the first place, the index of the foramen magnum yielded Scott the following figures: Average 87·3(48) for the sexes taken together; with this we can compare the corresponding figure for the Cambridge skulls, viz. 90·5(10) with a range of 35·8 units, as against 23·5 in Scott's observations. Secondly, the ophryo-spino-auricular angle gives results strikingly consistent with Scott's (see p. 173).

The nearness of these average results is the more striking when it is remembered that Scott's measurements were made with the aid of Broca's goniometer, while in the case of the Cambridge specimens the angles were measured after the including lines had been drawn through the several points projected by means of Broca's stereograph.

In considering the relation of the basi-nasal length to the mesial vertical circumference, we find that the former dimension is in the Cambridge specimens 25·3 per cent. of the curve over the vertex from basion to nasion, as compared with 24·7 per cent., which is recorded by Scott as the corresponding figure in his series.

In this table the figures within the small brackets denote the number of skulls available for statistical purposes.

	All available data	Skulls of both sexes	Skulls of males	Skulls of both sexes — Distribution into groups: Totals	Per cent.	Totals	Per cent.	Totals	Per cent.
Character	Cranial capacity			Mega-cephalic		Meso-cephalic		Micro-cephalic	
Scott's series ...	1460(47)	1416(38)	1455(29)	15	39·5	13	34·2	10	26·3
Cambridge series	1452·1(57)*	1415(10)	1436(8)	3	30	2	20	5	50
Character	Cephalic Index			Brachy-cephalic		Mesati-cephalic		Dolicho-cephalic	
Scott's series ...	76·1(58)	76·3(40)	76·3(30)	1	2·5	31	77·5	8	20
Cambridge series	76·4(68)*	78(10)	78·1(8)	2	20	7	70	1	10
Character	Vertical Index			Akro-cephalic		Metrio-cephalic		Tapeino-cephalic	
Scott's series ...	?	72·7(41)	72·6(31)	2	4·9	21	51·2	18	43·9
Cambridge series	72·6(51)*	72·5(10)	72·2(8)	0	0	7	70	3	30
Character	Orbital Index			Megasemic		Mesosemic		Micro-semic	
Scott's series ...	90·1(63)	89(42)	88·6(32)	20	47·6	18	42·9	4	9·5
Cambridge series	89·8(72)*	87·8(9)	87·7(7)	4	44·5	4	44·5	1	11
Character	Nasal Index			Platyrrhine		Mesorrhine		Leptor-rhine	
Scott's series ...	46·8(63)	46·8(42)	46·1(32)	0	0	15	35·7	27	64·3
Cambridge series	46·5(72)*	44·6(9)	44·3(7)	0	0	2	22·4	7	77·6
Character	Gnathic Index			Prognathic		Meso-gnathic		Ortho-gnathic	
Scott's series ...	97·6(56)	97·7(41)	97·8(31)	0	0	22	53·7	19	46·3
Cambridge series	97·3(65)*	96(9)	96·4(7)	0	0	2	22·4	7	77·6
Character	Palatomaxillary Index			Brachy-uranic		Mesuranic		Dolich-uranic	
Scott's series ...	119·5(47)	120·8(39)	120·8(30)	35	89·7	4	10·3	0	0
Cambridge series	118·9(57)*	116·3(10)	115·4(8)	8	80	0	0	2(?)	20(?)

* It must be noticed that the figures thus marked refer to data collected from all available sources, *i.e.* Scott's results from all sources combined with those yielded by the Cambridge specimens: for economy of space it was thought permissible to place these figures in the positions they now occupy, although, as will be seen, those particular lines are otherwise exclusively devoted to the Cambridge specimens.

	Male		Both sexes	
	No.	Average	No.	Average
Scott's observations ...	32	67°	42	67° 30′
Cambridge series	7	67° 30′	9	68°

The data resulting from the measurements of the several segments of the median sagittal arc may be summarised in the following table:—

Description of Specimens	Males (Scott)	Approximate corresponding frequency in the whole Cambridge series	Whole Cambridge series, actual data	Males (Scott)	Approximate corresponding frequency in the Cambridge series (males only)	Cambridge series (males only), actual data
F > O ...	22 (32)	26 (32)	8 (10)	22 (32)	28 (32)	7 (8)
F > P or O	20 (32)	22 (32)	7 (10)	20 (32)	20 (32)	5 (8)
P > F „ O	5 (32)	6 (32)	2 (10)	5 (32)	8 (32)	2 (8)
P < F „ O	13 (32)	16 (32)	5 (10)	13 (32)	16 (32)	4 (8)
O > F „ P	5 (32)	3 (32)	1 (10)	5 (32)	4 (32)	1 (8)
O < F „ P	16 (32)	10 (32)	3 (10)	16 (32)	12 (32)	3 (8)

EXPLANATORY NOTE.—F, P, and O indicate the respective lengths of the frontal, parietal, and occipital arcs. In modifying the data yielded by the Cambridge specimens, in order to make a closer comparison with Scott's figures, fractions have been ignored, and the nearest whole number has been recorded. This will explain what might otherwise be considered as errors.

From which one concludes that the two series are extremely alike.

From the measurements, we may now turn to a number of points of descriptive anatomy dealt with by Scott, the first whereof to be considered is the general shape of the cranial vault. Herein the Cambridge specimens entirely agree with the description provided by Scott; the same remark applies to the sutures, but no case of an interparietal bone occurred (among Scott's forty-nine skulls). As regards the region of the pterion, the new series presents five ossicles in this situation in the *ten* skulls examined (Scott: twenty-six in nineteen skulls). Other wormian bones are slightly less frequent than in Scott's series. Scott mentions the occurrence of paramastoid processes on one side or both in each of four skulls (? out of forty-nine). It may be possible that the term paramastoid includes processes that we should call paracondylar. However this may be, we noticed no unusual

paramastoid processes, but in five skulls unusually well developed paracondylar processes are seen (see especially No. 10), and we may now allude to the splendid collection of nearly seventy Mori-ori crania in the Museum of the Royal College of Surgeons; among these a long paracondylar process occurred once and on one side only. Aural exostoses are not to be seen in the Cambridge series, but one specimen at the College of Surgeons presents this condition. Out of seven of the (ten) Cambridge specimens, there are four with absence or closure of the postcondylar foramen on both sides, and in the other three this foramen exists on one side only. Scott gives its frequency of occurrence as twenty-three (? out of forty-nine skulls), on one side only, and complete absence in eight cases. In two male skulls at Cambridge the massive transverse occipital torus noted by Scott is present. The position of equilibrium of the Cambridge crania may be summarised as: anterior mastoid, four out of ten (Scott: one in forty-nine); posterior mastoid, four out of ten (Scott: eleven out of forty-nine); anterior condylar, two out of ten (Scott: four out of forty-nine). The pterygo-spinous foramen of Civinini is not seen in one of the Cambridge specimens, even in an incomplete form (Scott met with it—incompletely developed, however—in six cases).

The nasal bones conform precisely to Scott's description. Out of the ten Cambridge skulls, four are oxy-craspedote, and five bothro-craspedote (Scott says that the nasal margin is "rounded off" in twenty out of forty-nine skulls). As regards the so-called third occipital condyle, a faint marking in one of the Cambridge specimens suggests that an articulation may have existed in the situation of this process. Much more distinct are the facets shown by two skulls out of the sixty-five at the College of Surgeons. Of the lacrymal bone, it can only be said that while two (in the same skull) are fenestrated, this tendency, as well as that to the formation of a fronto-maxillary articulation within the orbit, is less marked in the ten Cambridge specimens than in Scott's series. The mandible has already been commented on.

It remains to notice the usage of the teeth, and we may mention that Scott remarks that the Mori-ori and Maori crania agree closely in this particular. Without quoting his description in detail, we may say that the curious usage and partial dislocation referred to by Scott and mentioned in the earlier part of this communication was observed by Scott in Maori as well as Mori-ori crania, and can also be seen in sixteen out of sixty-eight specimens in the College of Surgeons (the Mori-ori crania of the Barnard-Davis collection are here included). So, too, signs of alveolar abscesses, similar to those noted in the Cambridge specimens, were seen by Scott in the crania of his collection. One of

the Cambridge skulls shows a curious pit behind the third upper molar on both sides, which may have contained an additional tooth, but no trace of such a supernumerary structure remains[1]. In one adult skull at the College of Surgeons (No. 765 N) the third molar is diminutive.

Finally, it may be mentioned that an asymmetrical condition of the foramen magnum, and a tendency to the production of exostoses in the form of processes and bony bars (cf. Grünbaum, *Journal of Anatomy and Physiology*, vol. xxv.), near its posterior and lateral margins, characterise the specimens at Cambridge as well as those at the College of Surgeons.

To sum up, then, the chief value of the new series of Mori-ori crania will be based on the corroborative evidence they afford of the generalisations so often referred to in the course of this paper. At the same time, we are now in a position to regard them as quite typical specimens of the Mori-ori race, the differences of whose cranial characteristics from the Maori have been thus summed up by Scott, in speaking of the Mori-ori skull:—"It differs from the Maori skull mainly in its lesser height, both absolute and relative to length and breadth, the greater excess of the parietal over the frontal width, the higher orbits, and the narrower nasal opening. The depressed and retreating forehead is also a very marked feature of many Mori-ori skulls. It is slightly broader relatively to its length, and somewhat more prognathous. The cranial capacity is also somewhat less. But, as already pointed out, there is often a very close resemblance between Maori and Mori-ori skulls. The variation of the indices, though somewhat more restricted than with the Maoris, is still considerable, and points, like the traditions of the people, to an origin from the two great Pacific stocks. The different types of Mori-ori skull have been already sufficiently described."

From the study of the skulls we must now turn to that of the other bones of the skeleton, and the following notes embody the results obtained from observation of the two skeletons now at Cambridge:—

The Scapular Indices are represented by figures higher than those yielded by scapulæ of Europeans or Polynesians, but on the other hand are respectively lesser and greater than the average index afforded by Melanesian scapulæ.

The Clavicular Index.—Comparative data are still scanty, but it may be mentioned that these indices exceed those of European females and even of negresses by a good deal.

[1] A similar pit occurs in the upper maxilla of an orang-utan cranium in the Anthropological Institute at Munich: it is the more remarkable since this orang cranium possesses already two supernumerary molar teeth immediately in front of the pit referred to.

Platycnemia.—The skeleton No. 10 shows a distinct degree of platycnemia. The other skeleton, however, does not possess this character, so that no reliance can be placed on this indication.

Platymeria.—These indices show an extreme degree of platymeria.

In comparing the foregoing data with the records provided by Scott, it may be noticed that the scapulæ of the Cambridge skeletons are broader and therefore of an inferior type to those measured by Scott; that the degree of platycnemia, on the other hand, is less marked in the Cambridge specimens than in Scott's series; and that the differences that may exist between the right and left limbs of the same individual are so considerable as to seriously discount the value of conclusions drawn from any but very large series of measurements.

Stature.—The indication here is of extremely small stature—1470 mm. and 1441 mm. respectively. Allowance being duly made for the sex, the indication is rather against the skeletons having belonged to the ordinary or unmixed Polynesian type.

In conclusion, the evidence from the skeletons possesses little value in determining the race to which the individuals belonged. At least, however, one can note the *general* absence of signs of inferiority (or what are usually regarded as possessing such a significance), while the extremely diminutive stature of these females might possibly be cited as an exception to such a general indication.

The pelvic indices place the specimens in the mesatipellic group of Turner. It should be remarked that whereas the female pelvis in any case affords but little evidence of weight in assigning to any particular race a given skeleton, the indication here is still further obscured in the case of No. 1 (A) owing to the occurrence of osteo-arthritis. It remains to be said that Turner is inclined to place Melanesians in the mesatipellic group, while he supposed that Polynesians would probably come within the dolichopellic division. The fact that this index brings the Chatham Islands skeletons into relation with the Melanesians, while their cranial characters are those of Polynesians, need not be regarded as of great moment in the present state of our knowledge of the subject. On the other hand, Scott records the indices of two male and one female Mori-ori pelves, and these are all platypellic.

The proportions of the sacra place these in the platyhieric group, the influence of sex being felt herein. The index of B is very high and only surpassed in Turner's records by that of the sacrum of a Hindu female, viz., 127. Scott remarks that of three sacra measured by him, one (a male) was platyhieric; the two others (male and female respectively) were at the upper limit of the subplatyhieric group.

As regards the lumbar indices, disease has much modified the shapes

of the lumbar centra of No. 1, hence no doubt the figure 106·4, which falls in with those found in non-pathological spines of some Australians and Tasmanians. On the other hand, 93·2 the index of No. 10 is practically identical with the average figure deduced from observations on twenty-three Irish females (Cunningham, quoted by Turner).

The radio-humeral and tibio-femoral indices may be considered together. They would place the skeletons either actually, or almost in the same group as Polynesians or Melanesians, according to Turner. No conformation indicating inferiority is denoted by such an association.

The intermembral index shows that No. 1 (A) has similar proportions to the average European, the index of No. 10 (B) being a little higher (*i.e.* with slightly and only very slightly longer upper extremity). The effect of stature may be responsible for the difference.

As regards the femoral-humeral index, both skeletons show figures (73·5 and 71·7) but little removed from the average figure (72·2) given for Europeans (Broca).

Little more can thus be added to the remarks of Scott, who from the observation of five skeletons concludes that these "show in most instances a very close correspondence with what we find among the Maoris."

Mori-ori Crania.

Tables I. II. and III. present the principal dimensions, etc., of the crania and skeletons. Table IV. refers to observations made on the crania of Mori-ori natives in the Museum of the Royal College of Surgeons in London.

TABLE I.

Specimen No.	1	2	3	4	5	6	7	8	9	10	Average	Range
Sex	♀	♂	♂	? ♀	♂	♂	♂	♂	♂	♀		
Age	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Aged	Adult	Adult		
Maximum length	180	176	194	177	186	174	180	186	194	178	182·5	194—174
Maximum breadth	144	140	148	144	153	138	136	136	147	139	142·5	153—136
Ophryo-iniac length	168	166	180	166	178	166	176	172	189	169	173	189—166
Basi-bregmatic height...	134	123	140	128	132	131	134	139	129	135	132·5	140—123
Nasal height	51	54	61	52	56	54	54	52	?	54	54·2	61—51
Nasal width	26	23	28	24	21	24	24	25	?	23	24·2	28—21
Orbital height	35	37	38	34	38	37	35	36	?	37	36·3	38—34
Orbital width	39	43	43	40	40	40	41	44	?	37	40·7	44—37
Basi-nasal length	100	96	107	96	100	105	101	103	106	98	101·2	107—96
Basi-alveolar *length*	97	94	98	98	103	99	96	100	?	90	97·2	103—90
Horizontal circumference	511	494	539	505	536	498	498	510	546	499	513·6	539—494
Jugo-nasal width	96	99	99	95	96	97	98	98	?	91	96·5	99—91
Jugo-nasal arc	106	110	111	107	106	108	105	106	?	101	106·7	111—101
Cephalic index...	80	79·5	76·3	81·4	82·3	79·3	75·6	73·1	75·8	78·1	78*	82·3—73·1
Altitudinal index	74·4	69·9	72·2	72·3	71	75·3	74·4	74·7	66·5	75·8	72·5*	75·8—66·5
Alveolar index	97	97·9	91·6	102·1	103	94·3	95	97·1	?	91·8	96*	103—91·6
Nasal index	51	42·6	45·9	46	37·5	44·4	44·4	48·2	?	42·6	44·6*	51—37·5
Orbital index	89·7	86	88·4	85	95	92·5	85·4	81·8	?	100	87·8*	100—81·8
Naso-malar index	110·4	111·2	112·3	112·5	110·4	111·3	107·1	108·1	?	110·9	110·5*	112·5—107·1
Cranial capacity	1,315	1,300	1,685	1,445	1,590	1,310	1,290	1,345	1,520	1,350	1,415	1,290—1,685
Palato-maxillary index	121·5	? 104·1	115·8	117·3	109	115·6	121·1	116	124	? 123	116·3*	104·1—124
Index of the foramen magnum ...	90·7	79·3	100	115·1	96·9	91·4	84·8	81·8	85·7	79·4	90·5	79·3—115·1
Occipito-spino-auricular angle ...	71° 30′	66° 30′	66° 30′	69	67	66° 30′	70° 30′	66° 30′	?	68°	68°	66° 30′—71° 30′
Foramen magnum: sagittal diameter	32	34	35	33	32	35	33	33	35	34	33·6	32—35
Foramen magnum: *transverse* diameter	29	27	35	38	31	32	28	27	30	27	30·4	27—38
Palato-maxillary length	51	48	57	52	55	51	52	56	50	? 48	52·4	48—57
Palato-maxillary breadth	62	? 50	66	61	60	59	63	65	62	? 57	62·2	59—66
Frontal arc	127	124	134	125	134	116	125	128	123	123	125·9	116—134
Parietal arc	119	110	130	119	121	119	113	106	131	122	119	106—131
Occipital arc: supra-iniac part ...	77	73	80	74	65	67	75	96	70	66	74·3	65—96
Occipital arc: infra-iniac part ...	46	39	47	41	58	41	49	45	58	54	47·8	39—58
Total sagittal arc	369	346	391	359	378	343	362	375	382	365	367	343—391

* Index of the averages, and *not* average of the indices.

TABLE II. MORI-ORI SKELETONS.
A. With Cranium No. 1.
B. With Cranium No. 10.

Dimensions whence Indices are calculated	A	B
Length: humerus	285	271
,, radius	211	217
,, humerus and radius ...	496	488
,, femur	388	378
,, tibia	322	307
,, femur and tibia ...	710	685
,, clavicle	141	138
Scapula:		
height	145	131
breadth	99	94
Sacrum:		
length	107	89
breadth	125	113
Pelvic brim:		
conjugate diameter	125	118
transverse diameter	135	129
Tibia:		
R. antero-posterior	27	27
R. transverse	21	18
L. *antero-posterior*	27	30
L. transverse	21	18
Femur:		
R. antero-posterior	21	21
R. transverse	29	30
L. antero-posterior	21	21
L. transverse	30	30
Lumbar vertebræ:		
sum of anterior diameters ...	125	133*
sum of posterior diameters ...	133	124*
Total height of pelvis	185?	182?
Total breadth of pelvis... ...	255	237
Pubo-ischiatic length	94	90
Scapula:		
infraspinous length: right side	108	104
infraspinous length: left side	109	104
Middle of shaft of femur:		
sagittal diameter on R. ...	23	23
sagittal diameter on L. ...	24	23
transverse diameter on R. ...	24	24
transverse diameter on L. ...	24	24

TABLE III. THE SAME.
A. With Cranium No. 1.
B. With Cranium No. 10.

Indices	A	B
Pelvic (Brim)... ...	92·5	91·4
Sacral	116·8	126·9
Lumbar	106·4	93·2
Radio-humeral ...	74	76·4
Tibio-femoral ...	83	81·2
Intermembral ...	69·8	71·2
Humero-femoral ...	73·5	71·7
Scapular	68·2	71·7
Clavicular	49·4	50·9
Tibia (platycnemia) ...	77·7	*66·6* (60 L.)
Femur (platymeria)	72·4 R. and 70 L.	70 R. and L.
Total pelvic	72·5	76·6
Scapular, infraspinous:		
Right	91·7	90·4
Left...	90·8	90·4
Index of cavity of pelvis	69·6	69·7
Index of femur at middle of the shaft	95 100	100 100
Stature (from femur)	1,470	1,441

B, pathological.

TABLE IV.

To indicate some characters presented by Mori-ori crania in the Museum of the Royal College of Surgeons. The total number examined was sixty-five.

Character	No. of examples	Catalogue Nos. of specimens presenting the character	Per-centage
Asymmetry of foramen magnum	5	761—762—763—765 E—765 Zh	7·69
Third occipital articular surface	2	765 Zm—765 Zq	3·07
Scaphocephaly without synostosis in sagittal suture	1	765 K	1·53
Aural exostoses	1	765 N	1·53
Paracondylar process as in No. 10 Mus. Anat. Cant.	1	765 R	1·53
Excessive wear (with partial dislocation) of molar teeth ...	13	765 L .. M .. U .. Zb .. Zc .. Zg .. Zh .. Zv .. Zw .. Zx .. Zy .. Zz and three others from the Barnard Davis collection ...	20
Very Melanesian in appearance...	1	765 Zs	1·53
Strong resemblance to Maori skull at Cambridge	1	765 C	1·53

ON CRANIA OF ESKIMO IN THE UNIVERSITY MUSEUM.

THE Cambridge collection has been enriched by six skulls, and a complete skeleton, of Eskimo from Labrador, presented by E. Curwen, Esq., M.D., St John's College, Cambridge. The accompanying table gives their principal measurements and indices, which depart in no very important points from those already recorded by other observers. With these are arranged similar figures relating to the other crania of Eskimo in the University Museum. It may be added that the ten specimens as a series are characterised by (*a*) the small size of the nasal bones, (*b*) the form of the foramen magnum, which is long and in some cases almost pyriform, a backward prolongation encroaching on the squamous part of the occipital bone, (*c*) the tendency to reduplication of the infra-orbital foramina with persistent infra-orbital sutures.

The following notes deal in the briefest way with features of interest in individual specimens:—

Catalogue No. 1832. Inscribed "Eskimo, Davis Straits, Dr Skae." This is a very large adult male skull with prominent cheek bones; foramen magnum very large; mandible wide with everted angles. The sphenoidal spines are of unusual size, and the remaining teeth well worn.

No. 1833. Skull of Eskimo, Holsteinborg, S. Greenland. Probably an adult female. The foramen magnum is of considerable size, with postcondylar foramina. The mandible is wide, and the sigmoid notch very shallow.

No. 1834. Skull of Eskimo, Greenland, Macartney collection. This is the skull of an adult male; the facial parts are flat, but the nasal spine is long and sharp. The palate is of considerable width, the foramen magnum very long, the foramina ovalia are placed rather more externally to the pterygoid plates than usual.

DIMENSIONS OF SKULLS OF ESKIMO.

Measurements Catalogue No. of Skull Age and Sex	1833 Adult ♀	1834 Adult ♂	1867 Aged ♂	1832 Adult ♂	1868 Adult ♂	1869 Adult ♂	1870 Adult ♂	1871 Adult ♂	1872 Adult ♀	1873 Adult ♀
Cubic capacity	1385	1340	1550	1790	1480	—	—	—	1420	1225
Maximum length... ...	183	178	192 (171)	198	183	202	171 (?)	181 (?)	181	180
Maximum breadth ...	130	130	138 (127)	142	138	133	128 (?)	130	133	128
Basi-bregmatic height ...	128	135	136	141	145	140	—	139	139	129
Basi-alveolar length ...	94	97	—	101	104	—	—	—	98	91
Basi-nasal length ...	94	101	106	101	101	107	—	—	106	97
Orbital height	35	34	33	37	36	38	—	—	37	36
Orbital breadth	39	39	42	42	39	43	—	—	41	38
Nasal height	50	53	54	53	48	—	—	—	57	50
Nasal width	21	25	27	24	24	—	—	—	23	22
Cephalic index	71	73	71·9 (74·3)	71·7	75·4	65·8	74·9 (?)	71·8 (?)	73·5	71·1
Vertical index	69·9	75·8	70·8	71·2	79·2	69·3	—	76·8 (?)	76·8	71·7
Alveolar index	100	96	—	100	103	—	—	—	92·5	93·8
Orbital index	89·7	87·2	78·6	88·1	92·3	88·4	—	—	90·2	94·7
Nasal index	42	47·2	50	45·3	50	—	—	—	40·3	44
Palato-maxillary index ...	114	105·6	—	120	105·3	—	—	—	115·9	—
Facial (Kollmann) index	55·1	52·2	(?)	49·3	52·2	—	—	—	62·3	55·1
Stephano-zygomatic index	85·4	74·6	78·7	74·3	91·5 (?)	76·1	—	—	86·15	81·1
Gonio-zygomatic index ...	89	—	77·9	72·3	83·5	79·6	—	—	77·7	83·5
Naso-malar index ...	105·3	106·2	113·6	106·7	106·1	—	—	—	108	108·6
Horizontal circumference	507	499	540 (?)	539	519	550	476 (?)	500 (?)	510	495

No. 1867. Skull of Eskimo, from S. Greenland (purchased from the Lowestoft Museum). The skull of an aged male, with edentulous upper jaw. The roof of the cranium can be removed, and thus the cephalic index can be calculated from measurements on the interior of the brain-case which more nearly represent the dimensions of the cerebrum. The internal measurements give a cephalic index of 74·3; the external 71·9.

No. 1868. Skull from Port Hope, Ailek, Labrador, presented by E. Curwen, Esq., M.D. This is a large and heavy male skull with massive jaw; the nasal bones are remarkably diminutive; the sphenoidal spines large; the foramen magnum long and oval.

No. 1869. Eskimo from Blackhead, Hopedale, Labrador, presented by E. Curwen, Esq., M.D. From a grave with bronze ornaments. This is an immensely long and rather high skull; the facial bones have been in great part lost.

No. 1870. Eskimo skull from Hopedale, Labrador, presented by E. Curwen, Esq., M.D. A long and high skull.

No. 1871. Eskimo skull from Cape Ailek, Labrador, presented by E. Curwen, Esq., M.D. Foramen magnum very large; mandible massive with large teeth.

The three immediately preceding specimens have suffered so much from weathering that few remarks can be made with regard to them. The cranial portions seem to present the typical appearances.

No. 1872. Skull of Eskimo female, Cape Ailek, Labrador, presented by E. Curwen, Esq., M.D. A large massive skull with flattened facial bones.

No. 1873. Female skeleton from Labrador, presented by E. Curwen, Esq., M.D. The skull is small and the foramen magnum of remarkable shape, the nasal bones small, the sphenoidal spines long and sharp. The skeleton measures 1407 mm. in height; and the pelvis seems remarkably large in both transverse and conjugate diameters.

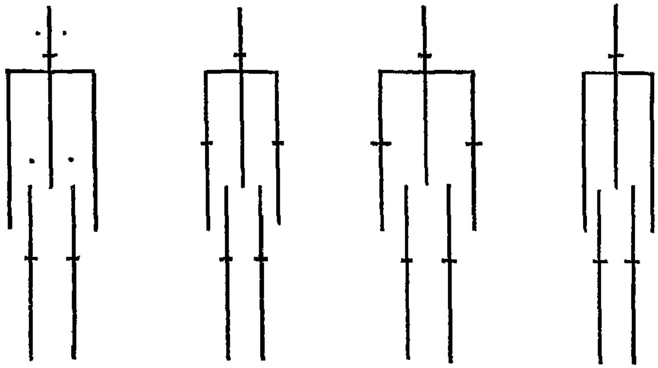
A CONTRIBUTION TO ESKIMO CRANIOLOGY.

(With assistance from B. H. PAIN, Esq., B.A., Emmanuel College.)

IN the course of the winter of 1899—1900 a number of Eskimo were exhibited in London at Olympia, and owing to the kindness of Mr Taber, the manager of this part of the exhibition, we were enabled to obtain measurements of the individuals of the party.

A description of these Eskimo and of the tables of the measurements communicated by us to the Cambridge Philosophical Society (in March, 1900) will be found in this volume (*v. infra*, p. 268).

The measurements afforded us the means of drawing to scale a diagrammatic figure representing the average male adult Eskimo, and



a. *b.* *c.* *d.*

Fig. 1.

this figure was then sufficiently reduced to bring it into line with those published by Professor Thomson, of Oxford, in *Knowledge*, June 1st, 1899. In fig. 1, our diagram for the adult male Eskimo (*a*) will be found compared with corresponding diagrams for adult males of (*b*) Anglo-Saxon, (*c*) Negro, and (*d*) of aboriginal Australian origin.

The remainder of our other communication consists of notes on the conditions of Eskimo life in Labrador, the native land of the individuals in question, and of comments on the general results of our observations in the light of records published by earlier workers (especially Virchow and Boas). It would be superfluous to recapitulate the conclusions arrived at, and in the present communication an attempt is made to determine the relations subsisting between the head and skull of the Eskimo, so as to obtain some idea of the modifying influence on cranial form and contour to be attributed to the overlaying soft tissues. In the second place, we have summarised observations on a large number of Eskimo crania which were studied by one of us in several European museums. Lastly, we record without comment notes furnished by Mr Taber on the Eskimo of Labrador, which are not specially of the nature of observations on their physical conformation.

Comparison of the Form of the Head with that of the Skull of the Eskimo.

Dealing in the first instance, then, with the comparison of the forms of the head and of the skull respectively, we naturally turn to the tables of measurements, and in the first place it is convenient to consider some absolute linear dimensions, without reference to the indices which are derived from them.

Number of Subjects measured.—From our measurements of the heads of the Labrador Eskimo, we obtained averages resulting from observations and records of eleven of the chief dimensions; and the material on which the observations were made consisted of eleven adult males and ten adult females, the measurements in the two sexes being treated of independently. (Table I.)

Number of Crania available.—In determining the corresponding dimensions of the Eskimo skull, we selected as many skulls of Labrador Eskimo as possible, supplementing the limited number of these by skulls of Greenland Eskimo. In this way we obtained averages based on observations of a number of crania of Eastern Eskimo varying from twenty and seventeen in the case of adult males, and from eight to eleven adult females (it was not possible at the time to obtain more undoubted female skulls than these).

The most important points in the accompanying Table (No. I.), to which attention should be drawn, are as follows:—Firstly, the length of the head is absolutely great both in males and females; and the same holds good with regard to the breadth of the head in the males,

in whom also the facial dimensions are of absolutely great size, both as regards the nasi-alveolar length and the bizygomatic breadth. The great size of the head is indicated also by the large figure representing the average horizontal circumference. Other comments on the dimensions recorded in Table I. will be made in connection with the indices, and it is now necessary to note the results of a comparison of the average dimensions of the head and of the skull respectively in the two sexes. (Table I A.)

The Head and the Skull compared in respect of Maximum Length. As the Table I A shows, close approximation is observed in the case of the maximum lengths of head and skull among the males, the average length of the head being 191·15 mm., and that of the skull 190 mm. From these figures it follows that the thickness of the soft parts overlying the skull of the living subject is but 1·15 mm., or ·575 mm. in front and an equal amount at the occiput, supposing the thickness to be the same in each case (which is not, of course, actually true). But such a margin as 1·15 mm. is quite inadequate, and the only conclusion is that there is an error in the determinations. It may be that the figure 190 mm. is too high for a correct representation of the average skull-length, or that 191·15 mm. is too low to serve as a proper representative of the head-length, or else, what is probably the case here, both these contingencies coexist. We are led to this conclusion from the consideration of the records made by Virchow (*Zeitschrift für Ethnologie*, Bd. xii.), for on combining with our figures those recorded by Virchow, we are enabled to calculate the average head-length of fourteen adult Labrador Eskimo, and this is found to be 192·4 mm. in place of 191·15. So that had we as many heads available for study as we had skulls (*i.e.* 20), the difference between the average head-length and the average skull-length would probably be still greater. Moreover, two of the Labrador skulls measured were weathered to a considerable degree and to some extent had been flattened; these skulls yielded figures which denote a greater horizontal length than the skulls originally possessed, and therefore helped, no doubt, to raise the value of the average skull-length to the high figure which actually represents it.

In the case of the collection of data referring to female heads and skulls (Table I A) a very much greater discrepancy between these two dimensions will be found to obtain on the average. Herein the head-length is probably too great, and indeed we were conscious at the time of making the measurements that this was the case, for the thick growth of hair and the manner of plaiting and of arranging it generally interfered to a considerable extent with the attempts to record the head-length with accuracy.

Nasi-alveolar (or Upper Facial) Length.—A noteworthy approximation is observed in the case of the nasi-alveolar length as measured on the head, when it is compared with the corresponding dimension of the skull. In the living subject the alveolar point, being superficial, is not hard to determine, but there is generally some difficulty in ascertaining the exact situation of the nasion. This difficulty is particularly great in the Mongolian races and their allies, in which category we may provisionally place the Eskimo, and the difficulty is not always overcome even by close attention to the careful instructions of Topinard.

The Orbit.—Close approximation is observed in the case of the orbital diameters in the males, though this is not the case in the females, so far as orbital width is concerned. The effect of this upon the orbital index will be realised subsequently. The modifying cause is probably a greater thickness of the subcutaneous tissues and a greater adipose deposit in this region in the female.

Horizontal Circumference.—The figures representing the horizontal circumference of head and skull require mention solely in order to indicate that the great excess of this dimension of the head over the corresponding measurement of the skull in the females is almost certainly due to the same influence as was mentioned with reference to the length of the head in females, viz., inaccuracy of measurement due to the amount and the mode of dressing the hair. It follows that the figure relating to the head is rather too great.

The Nose.—The nose and its dimensions next claim our attention. In both sexes the nasal height measured on the living subject approximates closely to the corresponding dimension as measured on the skull; but in respect of nasal width a most remarkable difference exists, and is attributable not only to the expansion of the alæ nasi in the case of the head, but also and more characteristically to the narrowness of the apertura pyriformis nasi of the skull. (As will be mentioned in another connection, a nasal index of 32·7 has been observed by one of us in a Greenlander skull.) We have supplemented the foregoing discussion of the measurements by diagrams drawn to scale on quadrille paper, and embodying all the dimensions observed by us which can be studied in norma facialis (figs. 2, 3). In preparing the diagrams, which are half the actual size of the originals, the average values of the maximum breadth of head and skull for the two sexes respectively were first marked. Outlines from photographs of male and female Eskimo skulls were then used as guides in the completion of the contours, which are thus those of the photographs mentioned, but modified in accordance with the values obtained for the several dimensions. It

must be noted that the average value of the bigonial breadth has been made use of, but as this was determined on the living persons only, and not on crania, no discussion on this part of the subject is possible.

Indices.—We may now pass on to the subject of cranial indices, and we must in the first place compare those based on the average dimensions of the Eskimo head, with those which are derived from the average dimensions of the skull in this race. And inasmuch as our own observations relate to two series of skulls, one being the Cambridge series, and the other that of the museum of the Royal College of Surgeons in London, we have combined data from both these collections in order to arrive at an average value for each dimension based on a sufficiently large number of individual records. But it is necessary to state very explicitly that three sets of data are to be kept quite apart and distinct for the very sufficient reason that in this *combined* series of indices (based on the study of male and female crania in both collections), the data relating to each sex are kept entirely apart; whereas in two other series of averages referred to hereinafter as the College of Surgeons series and the Cambridge series respectively, the average figures are derived from observations on males and females without distinction. We will therefore first take Table No. II., where the data for male skulls are kept distinct from those relating to female crania. Our measurements enabled us to determine the indices of the averages in five sets of dimensions, so as to afford average figures for five indices. It is perhaps hardly necessary to mention that this gives a slightly different result from a simple determination of the average of the indices. The indices are as follow:—The cephalic or breadth index (the maximum length and *not* the ophryo-occipital length of the head or skull being employed), the facial index of Kollmann (nasi-alveolar facial length and bizygomatic facial breadth), the naso-malar index of Oldfield Thomas (jugo-nasal arc and chord), the orbital and the nasal indices (of Broca).

Correspondence of Indices of Head with Skull in Males, compared with correspondence of the same Indices in Females.—We find a slight difference between the sexes when we compare the correspondences and the divergences of the indices in the head and skull respectively. For instance, the sexes differ when the breadth index is in question, but they agree in respect of the orbital and the nasal indices, and on the whole the agreements are greater than the differences.

The Males alone.—If we consider the males alone, we shall find that the facial and the naso-malar indices reveal, by their similarity in head and skull, a close agreement as regards the proportions expressed by those indices, from which we argue that these indices, when obtained

from measurements of crania, afford relatively reliable information as to the proportions of the face in the particular race under consideration (the Eskimo). Especially is this the case with Kollmann's facial index. It must not, however, be forgotten that these remarks refer to the case of the average and not to that of the individual example. In the next place, but always treating of the males alone, the breadth, the orbital, and the nasal indices yield average values more or less different in the head and the skull respectively, the greatest divergence being presented by the nasal index. Reverting to the breadth index, we see that the figure for the Eskimo head (77) differs from that of the skull (71·5) by no less than 5·5 units. The difference is estimated by Boas (*Zeitschrift für Ethnologie*, 1895, Band xxvii.) at 2·2 units for the Eastern Eskimo, and though this figure appears to us to be too low, yet we think that 5·5 is undoubtedly too high. In fact, this difference is influenced by the two factors mentioned previously in discussing the relation of the maximum length of the head to the maximum length measured upon the skull. We there saw that our observations in the case of the head yielded a figure (191·15 mm.) probably below the true average, whereas the corresponding measurements on the skull gave (in consequence of two weathered skulls being admitted) too high an average figure (190 mm.). Both influences determine the magnitude of the difference of 5·5 which we are now discussing, but the study of the indices shows us that inasmuch as the average breadth index of the skull obtained by us agrees closely with those obtained by earlier observers[1], we should therefore attribute a more prominent part to the former (viz., the measurement of the length of the head in the living) than to the latter (viz., the measurement of the length of the skull) in producing the discrepancy in question, and Bordier's record (Topinard, *op. cit.*, p. 409, average index of four Eskimo heads 73·7) supports this conclusion. In other words, the difference observed between the cephalic indices of the average head and of the average skull is greater than is probably the case in reality; and it is probably due to the fact that the figure (77) representing this index for the average head is too great, and not so much to the fact that the figure (71·5) which is the index for the average skull is too small.

Orbital Index.—In the two remaining indices, differences of considerable degree are also found to exist when the figures relating to the

[1] Cf. Topinard, *Éléments d'Anthropologie Générale*, p. 357; De Quatrefages and Hamy (*Crania Ethnica*, average breadth index of two Eskimo skulls from Labrador in the Blumenbach collection, 70·5); also Boas, *loc. cit.*, and Schenk (*Bulletin de la Soc. Neuchâtel: de Géographie*, 1899).

average head are compared with those yielded by the average skull. This difference in the case of the orbital index is probably determined by the slight inaccuracy in determining the width or horizontal diameter of the orbit in the living subject. As a rule it is almost impossible to determine this diameter in a way strictly comparable to that employed when the skull is being measured. Males and females are alike in respect of this difference in the orbital index, and the disturbing cause is probably the same in both.

Nasal Index.—As regards the nasal index, we find here, as we should expect, the greatest difference between the cephalic and the cranial figures, amounting to nearly 19 units. As was previously remarked, there is a great difference between the nasal width as measured on the living subject and the width of the apertura pyriformis nasi, known as the nasal width of the skull.

Female Examples.—The preceding remarks refer to male subjects. When we pass to the consideration of the female crania, we find in respect of the cephalic or breadth index a much closer agreement between the average head and skull than in the male. It must be remembered that we are dealing with very small numbers of specimens here, as undoubted female Eskimo skulls, especially from Labrador, are scarce. Carr's figures, quoted by Topinard (*op. cit.*, p. 376), give a figure (70·9) considerably below ours (73·1), so that we cannot suppose that the sexual factor is accountable for the difference between the average male and the average female skull in respect of the breadth index as shown in our table. We think that further discussion will be more profitable when a larger number of female heads and of female crania have been measured, and the results will almost certainly show that the correction necessary to obtain the cephalic index of the living individual from the index yielded by the skull will be different in the two sexes. Such an allowance for the sexual factor is made in other instances by Mies (see Ripley, *L'Anthropologie*, 1896, and Topinard, *op. cit.*, list of references, p. 374).

With regard to the facial index, it is equally hard to explain the discrepancy that exists between the average female head and skull. Most probably the determination of the nasi-alveolar length in the living is the disturbing factor. The remarks already made with respect to the naso-malar, to the orbital, and to the nasal indices in the males apply equally to the females and need no supplement in this place.

Other Series of Measurements and Records.—It remains to mention the results of our measurements of the Eskimo crania in the museum of the Royal College of Surgeons and of those in the Cambridge Anatomical Museum. We may repeat the warning that the figures

we are now considering relate to all Eskimo crania, male and female alike, in each of those collections, whereas up to this point we have kept the data based on observations on male crania apart from those yielded by female skulls. We have, moreover, in the case of the series at the museum of the College of Surgeons, a larger number of individuals than was available for the construction of Table IA, on which to base our conclusions; and at Cambridge skulls from Labrador form a very large proportion of the whole series. The data enable us to calculate the five average indices already spoken of in connection with the measurements of the head (viz., the cephalic or breadth index, the facial index of Kollmann, the naso-malar index of Oldfield Thomas, the orbital index of Broca, and the nasal index of Broca). We will first institute comparisons of the cephalic or breadth index of the skulls in the museum of the Royal College of Surgeons comprising males and females, with the same index derived from the study of male skulls alone (from the College of Surgeons and from Cambridge). We see (Table III.) that when male skulls alone are considered the index of the average (71·5) is slightly lower than the average of all the Cambridge skulls (eleven in number) measured; while it is distinctly below that (72·03) of the males and females measured at the College of Surgeons (twenty-four in number). In the whole series of comparisons the differences do not exceed 2·5 units, except in the case of the facial index of Kollmann, where the difference amounts to 3·18 units. But the disturbing series is that at Cambridge, and the modifying factor is almost certainly the index given by an adult female skull (1872) which amounts to the unusually high figure of 62·3; and since only six skulls of this series were available for the determination of this particular index, the influence of a single index of such high value is brought out very strongly in the average. On the whole, then, we conclude that the records of Table II. amount to a very close approximation to the actual state of cranial proportions in the Eastern group of the Eskimo. We have also analysed the cranial characters of the Labrador Eskimo as represented by the specimens presented by Dr Curwen to the Cambridge Anatomical Museum; we have carefully revised the measurements of these skulls (cf. page 182), and the indices derived from the measurements, and in working out the averages of the indices obtained, it became apparent that the greatest divergences from the averages were met with in the skulls of the Labrador Eskimo, and not among the skulls of the Greenland Eskimo. Not only was the greatest divergence in the averages found in the cephalic, vertical, and nasal indices, and also in the horizontal circumference of the Labrador Eskimo skull, but in the ten specimens

which comprise the series, the Labrador skulls were the most divergent from one another. In the cephalic index this was most striking, the highest index of all the ten skulls being provided by a Labrador skull with an index of 75·4, and the lowest of all the ten skulls being that of a Labrador skull with an index of only 65·8. Again, considering the horizontal circumference in the series of ten skulls, the largest circumference (of 550 mm.) is that of a Labrador skull, and the smallest circumference (476 mm.) is also that of a skull from Labrador. A similar variation was found in the facial index of Kollmann—the average was 54·36, but the greatest index above this number was that of a Labrador Eskimo skull (index = 62·3). So the point which seems to be worth emphasising is this: that in comparing Labrador and Greenland Eskimo, the greatest divergences are to be met with in the crania of Labrador Eskimo, and that the crania of the Greenland Eskimo are more constant in the particular features observed.

The actual figures and the average indices will be found in Table IV. (*q.v.*).

Certain Craniological Characters of the Eskimo.

The second part of our communication deals, as has been previously intimated, with certain craniological features of the Eskimo as viewed in the light of observations incidentally made in the course of the foregoing investigations. The following are those to which special attention has been paid:—

The scaphocephalic character of the Eskimo cranium;
The frequency of a persistent infra-orbital suture;
The asymmetry of the foramen magnum;
The usage of the teeth, especially of the incisors;
The thickening of the body of the mandible;
The characters of the skull of the Eskimo child;

and the percentage frequency of several of these will be found in Table V.

Scaphoid Skulls and Obliteration of Sutures.—It is well known that a scaphoid appearance of the cranium (most easily perceptible when the view is that of norma facialis or occipitalis) is very common in Eskimo crania; and whereas such a degree of scaphocephaly is very commonly (but by no means invariably) associated with obliteration, either partial or complete, of the sagittal suture in the skulls of other races, such synostotic fusion of the two parietal bones is in the

Eskimo crania not nearly so common as in those of other races. An extreme degree of development of the scaphoid character is to be seen in the skull labelled A.B., δ, 15, 141, of the collection in the Anatomy School at Copenhagen, and this skull presents no sign of even incipient obliteration of the sagittal suture. We have tested the accuracy of the statement, as regards Eskimo crania in general, by observations on twenty-eight crania of Eskimo in the museum of the College of Surgeons in London. In eleven of these the scaphoid character was strongly marked, but only in one of the eleven was there anything more than quite a negligible amount of sagittal synostosis. Other very good examples of the degree of scaphocephaly which may be attained before the sagittal suture has become obliterated is to be observed in the cranium No. 48A of the Anatomical Museum at Kiel, and in an Eskimo skull at Halle. In the former (cf. fig. 4), obliteration of the sagittal suture is incipient only. The other three crania represented in fig. 4, though not Eskimo, are not without interest, as showing the absence of the scaphoid character of the cranial vault in specimens in which the sagittal suture had become obliterated at an early (and in one case at an almost infantile) period[1]. This is a convenient place to mention that in contrast to the foregoing condition, where the sagittal suture remains unclosed, and also to the next subject of consideration, viz., the persistence of the infra-orbital suture on the facial aspect of the cranium, there may occur in aged individuals a very complete synostosis even among the Eskimo. Such an aged Eskimo skull is to be seen in the Stuttgart Museum. In this specimen synostosis has occurred even in the maxillo-malar suture, which has been obliterated thereby.

Infra-orbital Suture.—The comparatively great frequency with which the facial part of the infra-orbital suture persists in adults seems to be another characteristic of Eskimo crania. The following data have been collected by us in illustration of the frequency of this occurrence :—

In the very large collection of skulls of the Greenland Eskimo in the anatomical museum of the University at Copenhagen, one hundred and eighty-five examples were examined, and the suture found in eighty-one skulls on one or the other side of the face. Of the collection of Eskimo crania in the museum of the Royal College of Surgeons in London, twenty-four were examined, and nineteen showed persistence of the suture, in fifteen of which the persistence was bilateral, the suture remaining on one side only in the other four specimens. Combining

[1] We thus have evidence that Virchow's well-known generalisation on this subject is not without exceptions.

the two sets of observations, we may say that the suture persisted in one hundred out of two hundred and nine crania of Eskimo adults.

It would seem from observations on crania of the gorilla that persistence of the suture may be associated with great lateral expansion of the upper maxilla, for in the crania of gorillas the suture persists for a considerable time: the well-known characteristic of Eskimo skulls, viz., great bi-malar width, would thus be explained. But this is not an entirely satisfactory explanation, for in the orang-utan, an ape in which there is at least as great a development of the upper maxilla in the lateral direction as in the gorilla, the infra-orbital suture is closed comparatively very early.

The Contour of the Foramen Magnum.—The foramen magnum and its surroundings next claim attention. The pyriform shape due to imperfect ossification at the posterior margin is a very frequent character, though it is perhaps hardly correct to speak of it as an anomaly, for it is apparently a retention of the infantile character of this foramen. It was observed in nine out of twenty-four skulls in the museum of the Royal College of Surgeons, and in four out of eleven cases at Cambridge. Asymmetry of the marginal contour is also not uncommon; sometimes the condyles are involved in the distortion. At Copenhagen, two hundred and nine Eskimo crania were examined with reference to the occurrence of asymmetry in the margin of the foramen magnum, and three instances of this condition occurred. At the museum of the Royal College of Surgeons the frequency of this asymmetry in Eskimo skulls was much greater, viz., four cases among twenty-eight crania. Combining the two sets of data, the frequency observed is seven in two hundred and thirty-seven crania.

Additional Facet on margin of Foramen Magnum.—As regards the frequency of occurrence of an additional articular facet on the anterior margin of the foramen magnum, this was presented by three skulls only out of one hundred and eighty-five crania of Greenland Eskimo (Copenhagen collection) examined.

Eustachian Processes.—It is convenient to mention in this place that two out of fifty-five Eskimo skulls (at Copenhagen) bear large Eustachian processes on the petrous bones on either side (such processes being commoner in the lower than in the higher races, and not infrequent in gorilla skulls).

The Teeth.—The following notes refer to the condition of the teeth:—Among the Eskimo skulls in the Copenhagen collection, the appearance described long ago (1861, *Nat. Hist. Review*) by Lord Avebury as characteristic of Greenlanders is not met with very frequently. The Copenhagen skulls are mentioned separately as being

those of Greenlanders, but the appearance referred to (the incisors meeting edge to edge and the surface becoming much worn) is not frequent among the Eskimo crania in the collections in London and Cambridge, including crania from Labrador. In one skull at Copenhagen the lateral incisors had not been developed, although the skull was that of an adult. The palate in this specimen is wide and the teeth large. In three crania of the same Eskimo series, and also (and especially) in the Eskimo skull No. 48A of the anatomical collection at Kiel (the specimen figured in connection with synostosis and scaphocephaly), the same curious dislocation of the molars so frequent among Maori and Mori-ori skulls (where there is great usage of the lateral surface of the crown and of the exposed root or roots) is observed (cf. p. 174).

Thickening of the Mandible.—The next point to which we must refer is a remarkable thickening of the body of the mandible, not exclusively confined to, but very common in, Eskimo and Greenland crania. The thickening is most marked about the level of the second molar tooth, and is due to a subperiostial deposit, the exciting cause of which is uncertain. This thickening was observed in six out of twenty-four Eskimo crania in the museum of the Royal College of Surgeons, and in four mandibles out of eight at Cambridge.

Nasal Skeleton.—Several points in connection with the nasal skeleton deserve special mention. Thus in two skulls out of fifty-six at Copenhagen, well marked pre-nasal fossæ were observed; again, in the Anatomical Museum at Kiel, where there is a collection of some ten skulls from Greenland, excessively attenuated nasal bones are seen in specimen No. 11, while No. 19 of the same series has the lowest nasal index (viz., 32·7) with which we have yet met.

Crania of Children.—The Kiel series, moreover, contains three crania of Eskimo children, which are of special interest, for they enable us to learn which of the striking characters of the adult Eskimo cranium have been early acquired, and which are assumed comparatively late in the period of growth from childhood. Other crania were carefully observed with this object in view, and the opportunity was taken of similarly observing some crania of Eskimo children at Copenhagen. Though the support of numerical data cannot yet be appealed to, it is submitted that the following characters the adult Eskimo crania appear very early, and therefore may be regarded in the adult as retentions of infantile characters. These are :—

1. The dolichocephalic character. (Two mesaticephalic Eskimo crania were seen at Copenhagen, but these were not crania of children and possibly not of pure Eskimo.)

2. A megasemic orbital aperture.
3. A pyriform contour of the foramen magnum.
4. A flattened nasal skeleton.
5. Prominence of the chin. (This prominence is perhaps more apparent, in consequence of the condition referred to in No. 4, than real.)
6. Small mastoid processes.
7. A longitudinal palatine torus.
8. Persistence of the infra-orbital suture.

Whereas the following characters have been acquired by the skull in the course of growth:—

1. A low nasal index, depending on relative narrowness of the apertura pyriformis nasi.
2. A scaphocephalic cranium without sagittal synostosis.
3. Greater prominence of the malar bones.

In concluding this paper, we wish to refer to two other specimens at Copenhagen, viz., A.B., *a*, 56, a Greenland cranium remarkable for being atypical in its facial though typical in its cranial features, and thus constituting a transitional type; and No. 159, where the external pterygoid plate is most curiously perforated and a reduplication of Civinini's foramen may be seen (the question of weathering is excluded). Finally, we have to reserve the consideration of the brain of the Eskimo, though the accounts of Chudzinski and Hrdlicka are not quite in accord on this subject, and the subject is one of great interest.

References to and explanations of the accompanying tables will be found in the text; but further, we have added a series of notes provided by Mr Taber, and it should be understood that they are recorded without comment and as nearly as possible in the form in which they were communicated to us, for they belong to rather a different aspect of anthropology from that to which we have endeavoured to confine ourselves in the foregoing communication.

TABLE I.

NOTE I. It is to be noticed that in four cases the figures here given differ slightly from those published in the *Proceedings of the Cambridge Philosophical Society*. The four figures are marked thus ×, as in the case of the facial breadth. An error in the measurement of this dimension in one of the men, "John," was detected in revising the averages, and raises this average by ·5 mm., and in the case of the women an alteration of ·1 mm. is needed; the other two are altered, *i.e.*, slightly increased, by the inclusion of the measurements of another individual, so that these averages are now based on data from five instead of four individuals.

TABLE I. MEASUREMENTS ON THE LIVING ESKIMO. TABLE I A. COMPARISON OF HEAD WITH SKULL OF ESKIMO.

Measurements	Males	No. available	Females	No. available	Males: Head	No. available	Skull	No. available	Females: Head	No. available	Skull	No. available
Maximum length of head ...	191·15	(11)	190·25	(10)	191·15	(11)	190	(20)	190·25	(10)	179	(11)
Maximum breadth of head ...	147·65	(11)	141·8	(10)	147·65	(11)	136	(19)	141·8	(10)	131	(11)
Breadth of face	× 142·2	(11)	× 136·6	(10)	142·2	(11)	139	(17)	136·6	(10)	129	(6)
Nasi-alveolar length	73·15	(18)	69·35	(10)	73·15	(11)	72	(18)	69·35	(10)	70	(8)
Jugo-nasal chord	116·6	(10)	× 113·4	(5)	116·6	(10)	100	(18)	113·4	(5)	98	(8)
Jugo-nasal arc	127·1	(10)	× 122·8	(5)	127·1	(10)	107	(18)	122·8	(5)	104	(8)
Orbital height	34·9	(11)	36·6	(10)	34·9	(11)	35	(16)	36·6	(10)	34·5	(9)
Orbital width	42·6	(11)	42·7	(10)	42·6	(11)	40	(10)	42·7	(10)	38	(9)
Horizontal circumf. of head	559·5	(11)	547·2	(10)	559·5	(11)	525	(17)	547·2	(10)	498	(9)
Nasal height	57·4	(10)	51·25	(4)	57·4	(10)	53	(15)	51·25	(4)	50	(9)
Nasal breadth	36·8	(10)	·32	(4)	36·8	(10)	24	(15)	32	(4)	22	(9)

Table I A.

Note I. The above dimensions, with the exception of the maximum length and the horizontal circumference, are reproduced in the diagrams (see figs. 2 and 3).

Note II. The average value for the maximum length of the head when the records made by Virchow are combined with our data is 192·4 mm. (fourteen heads). Virchow's other data have not been worked up into combination with ours. Cf. Virchow, *Zeitschrift für Ethnologie*, Band xii, 1880.

Note III. See also Schenk, *Bull. de la Soc. Neuchât. de Géographie*; abstracted in the *Centralblatt für Anthropologie*, 1900. Two skulls of Labrador Eskimo in the Lausanne Museum are described, and among other measurements we find: Hor. circ. 540 and 533, average 536·5 (2), which with our figures gives an average of 526 for nineteen skulls, supposing the Lausanne skulls to be those of males. Facial breadth, 137 and 134, average 135·5—with our figures gives 138·6 (19) as the average. But our figures are only very slightly altered thereby.

Table II.

Indices based on data provided in Table I A	Males		Females	
	Head	Skull	Head	Skull
Cephalic or breadth	77	71·5	74·5	73·1
Facial (Kollmann) ...	51·4	51·8	50·7	54·2
Naso-malar (Thomas)	109·6	107	108·3	106·1
Orbital	81·9	87·5	85·7	90·1
Nasal	64·1	45·3	62·4	44

Table III.

Indices	Males		Males and Females	
	Data provided in Table I A		R.C.S.	C.
	Head	Skull	Skull	Skull
Cephalic or breadth	77	71·5	72·03	71·8
Facial (Kollmann) ...	51·4	51·8	51·18	54·36
Naso-malar (Thomas)	109·6	107	106	107·9
Orbital	81·9	87·5	88·5	88·65
Nasal	64·1	45·3	42·8	45·55

R.C.S. Museum of Royal College of Surgeons.
C. Cambridge Anatomical Museum.

Table IV. Averages of Measurements of the Ten Skulls of Eskimo in the Anatomical Museum at Cambridge.

I. Average *Cephalic Index* = 71·8. 10 skulls (Labrador and Greenland).

Greatest divergence above = 75·4 } *both Labrador* skulls.
" " below = 65·8 }

4 Greenland skulls. Average *Cephalic Index* = 72·5.

6 Labrador " " " " = 72·08.

Greatest divergence above = 75·4 } *both Labrador* skulls.
" " below = 65·8 }

II. Average *Vertical Index* = 73·5. 9 skulls. Labrador and Greenland.
Greatest divergence above = 79·2 } *both Labrador* skulls.
" " below = 69·3 }

III. Average *Orbital Index* = 88·65. 8 skulls. Labrador and Greenland.
Greatest divergence above = 94·7—a *Labrador* skull.
" " below = 78·6

IV. Average *Nasal Index* = 45·55. 7 skulls. Labrador and Greenland.
Greatest divergence above = 2 of 50—one was a *Labrador* skull.
" " below = 40·3—a *Labrador* skull.

V. Average *Facial* (Kollmann) *Index* = 54·36. 6 skulls. Labrador and Greenland.
Greatest divergence above = 62·3—a *Labrador* skull.
" " below = 49·3

VI. Average *Naso-Malar Index* = 107·9. 7 skulls. Labrador and Greenland.
Greatest divergence above = 113·6—a Greenland skull.
" " below = 105·3 "
Average of *Labrador* skulls = 107·5—(more constant).

VII. Average *Gonio-zygomatic Index* = 80·5. 7 skulls. Labrador and Greenland.
Greatest divergence above = 89—a Greenland skull.
" " below = 72·3 "
Average *Labrador* skull = 81·07—(more constant).

VIII. Average *Stephano-zygomatic Index* = 80·9. Labrador and Greenland.
Greatest divergence above = 91·5—a *Labrador* skull.
" " below = 74·6—a Greenland skull.

IX. Average *Palato-maxillary Index* = 112·1. Labrador and Greenland.
Greatest divergence above = 120—a Greenland skull.
" " below = 105·3—a *Labrador* skull.

X. Average *Horizontal Circumference* = 513·5. Labrador and Greenland.
Greatest divergence above = 550—a *Labrador* skull.
" " below = 476—a *Labrador* skull.

TABLE OF VARIATIONS IN TEN ESKIMO SKULLS AT CAMBRIDGE.

Index or *Character*	Average	Range of Variation	Extremes	Labrador or Greenland	
				Highest	*Lowest*
I. Cephalic	71·8	9·6	75·4— 65·8	Labrador	Labrador
II. Vertical	73·5	9·9	79·2— 69·3	"	"
III. Orbital	88·65	16·1	94·7— 78·6	"	Greenland
IV. Nasal	45·55	9·7	50·0— 40·3	"	Labrador
V. Facial (Kollmann)	54·36	13·0	62·3— 49·3	"	Greenland
VI. Naso-malar ...	107·9	8·3	113·6—105·3	Greenland	"
VII. Gonio-zygomatic ...	80·5	6·7	89·0— 72·3	"	"
VIII. Stephano-zygomatic	80·9	16·9	91·5— 74·6	Labrador	"
IX. Palato-maxillary ...	112·1	14·7	120—105·3	Greenland	Labrador
X. Horizontal circumference	513·5	74·0	550—476	Labrador	Labrador

TABLE V.

Frequency of occurrence of certain anomalies	Per cent. (figures in brackets indicate the absolute number examined)	Aboriginal Australians. Per cent.	Gorillas. Per cent.
Persistence of pars facialis of the infra-orbital suture	47·84 (209)	43·4	18·8
Pyriform shape of the foramen magnum ...	40 (35)	—	—
Asymmetry of the foramen magnum	2·95 (237)	—	—
Third articular facet on margin of foramen magnum	1·61 (185)	15·15	1
Eustachian spines on basal surface of petrous bones	3·63 (55)	—	—
Thickening of the body of the mandible ...	30 (32)	—	—

MISCELLANEOUS NOTES FURNISHED BY MR R. G. TABER.

I. *Names.*—No family names. Tribal names derived from district, *e.g.*, Nack-vack tribe, etc.

II. *Religion.*—These Eskimo are all Christians. The Moravians, who are missionaries and traders, have had a station at Hebron for about 80 years. "Wise men" or "Conjurors" disappear when a tribe becomes Christianised. One of Taber's Eskimo was formerly a "wise man," but since becoming a Christian has retired from that profession.

III. *Marriage.*—This is celebrated according to the Moravian rite among the Christianised Eskimo, one of the missionaries officiating; should the services of a missionary not be available, marriage would probably not be postponed on this account. Polygamy has ceased among the Christianised Eskimo. One of Taber's Eskimo had two wives formerly.

IV. *Inter-marriage, and Half-breeds.*—As a general rule half-breeds are uncommon. The Eskimo never, so far as is known, intermarry with Indians in Labrador, so the parentage of the half-breeds, as in the case of the child Nancy in Taber's party, is generally European and Eskimo. So great is the dislike of the Eskimo for the Indian, that when two parties meet at a trading post of the Hudson Bay Company, they invariably camp far apart, in some cases on different banks of a river.

V. *Movements.*—In summer the Eskimo of Labrador wander considerable distances along the coast and over the islands; the Indians in summer also invade Labrador, retiring in winter, though in summer they may travel as far north as Cape Chudleigh.

VI. *Climate of Labrador.*—Taber has written a detailed account of this in an American periodical called *Outing*. In winter there is daylight between 9 a.m. and 3 p.m. The general appearance of the environs of Hebron is, to judge from photographs, desolate in the extreme.

VII. *Decrease in the Eskimo Population* is ascribed by Taber to the following influences:—Use of European dwelling-places. Cooked food; the Eskimo cook almost all food now, except certain small fish, which are eaten raw. Admixture by marriage. General changes in mode of life owing to European influence.

VIII. *General Folklore.*—Taber is about to publish the accounts furnished by the Labrador Eskimo of the origin of the seal; of the origin of the "Northern Lights"; also a legend of a great flood.

IX. *Kajaks.*—The Labrador model is identical, even in details, with that in use in Greenland and figured by Nansen (*Eskimo Life*). One of Taber's Eskimo, "John," said that balancing by means of the paddle was not necessary for a good kajak man, who would be quite independent of such an use of the paddle.

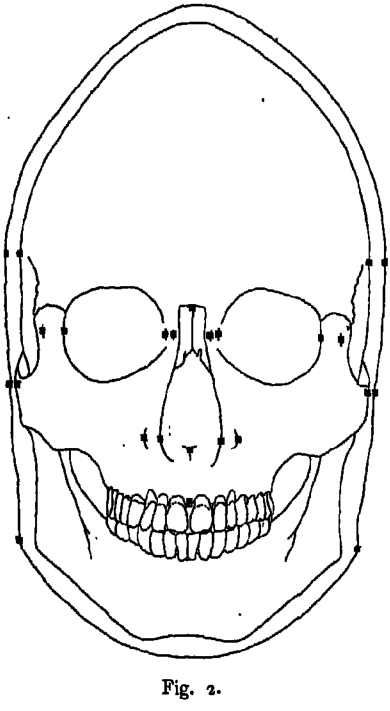


Fig. 2.

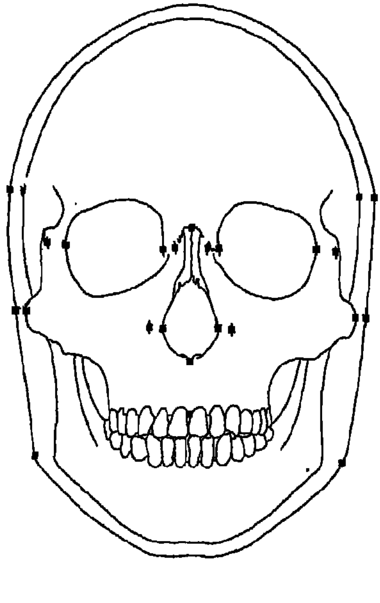


Fig. 3.

1 2

3 4

5 6

7 8

Fig. 4.

Views in Norma Facialis (Nos. 1—4) and Norma Lateralis (Nos. 5—8) of Four Skulls from the University Museum of Human Anatomy at Kiel.

The Eskimo cranium (Nos. 4 and 8) is very scaphoid, yet synostosis in the sagittal suture is not complete. In the three European crania (Nos. 1—5, 2—6, 3—7) the smallest of which (Nos. 2—6) is a very young skull, complete obliteration of the sagittal suture through premature synostosis is seen to have occurred without any accompanying scaphocephalic appearance. In two of the European crania (Nos. 1—5, 2—6) practically no deformation has occurred, though in the smaller of these, synostosis was very complete in all the cranial sutures. In the largest European cranium (Nos. 3—7), some distortion has been produced in the direction of akrocephaly.

These specimens afford examples of exceptions to the general rule enunciated by Virchow as to the relation between cranial growth, and synostosis of cranial sutures.

NOTE ON A SKULL FROM SYRIA.

THE specimen under consideration is the massive skull of an adult male which was picked up near Damascus after the massacres of 1860. For the loan of this specimen I am indebted to C. W. Cunnington, Esq., and I have made some notes descriptive of its more striking features. Mr Cunnington kindly made some of the measurements which are appended.

The skull (cf. fig. 1) is of considerable weight and capacity (the latter being about 1650 c.c.). It bears four distinct wounds to which no doubt death was due. At the bregma is a large and nearly quadrate hole, from which the missing piece of the left parietal bone was no doubt removed by a sword-cut, of which unmistakable evidence is afforded by the clean-cut character of the posterior margin (45 mm. in length). From this side, a crack or fissure traverses the left parietal bone obliquely to end eventually in the lambdoid suture. At the external angular process of the frontal bone on the left side, is a large deficiency due to destruction of the superciliary margin and parts adjacent to it, leaving a depression of cup-like shape and about 20 mm. in diameter. The third wound is a clean cut 36 mm. long just above the right parietal eminence: and a fourth wound is seen as a clean-edged incision dividing the root of the left zygomatic arch. Part of the lateral margin of the skeleton of the nose is absent from the right side, but there is no certain indication that this deficiency is of a traumatic nature. However this may be, the condition of the bones of the cranial vault affords abundant evidence of violence.

Most of the teeth have dropped out, but those remaining are of large size and good quality. Otherwise the skull is in good preservation and has suffered little or nothing by weathering. Having remarked the massive glabellar prominence and other muscular ridges and prominences, the asymmetry of the specimen next demands attention. The

skull is plagiocephalic. There is great parieto-occipital flattening, but this is much more marked on the right than on the left side, so that there is comparatively great backward projection on the left side of the conjoined parietal bones (the sagittal suture has long been closed by ossification). But it is remarkable that while thus laterally asymmetrical, there is no concomitant torsion or even lateral flexion of the basis cranii, and that the occipital condyles, though dissimilar in size, are on the same horizontal plane (which is a somewhat unusual occurrence in plagiocephalic crania).

From the indices (see Table) the skull will be seen to be brachycephalic, akrocephalic, orthognathous, microseme, and leptorrhine. The figure representing its cubic capacity places it in the megacephalic division (Flower).

The skull may be compared in the first instance to a specimen in the museum at Nicosia, Cyprus (for a sketch of which I am indebted to my brother, the Rev. H. T. Forbes Duckworth, M.A.), in which the same features of prominent brow ridges with parieto-occipital flattening are seen to be associated. But the Nicosia skull does not present marked asymmetry.

Turning to the Syrian skulls in the Anatomical Museum at Cambridge, I will only mention here, as a full description of these skulls will be published by E. M. Corner, M.A., that at least two types are recognisable, and that of skulls presenting parieto-occipital flattening of a degree comparable with that of the Damascus specimen, only one was found, whose outline is here figured (cf. No. 2, fig. 2). The latter, however, while resembling the Damascus cranium in this respect, in all others resembles more closely a skull figured by Topinard and described as the artificially deformed cranium of a Maronite (cf. No. 1, fig. 2). According to this author, artificial deformation is habitual among the Maronites. This must not be overlooked in basing comparisons on the contours of various crania from this region.

For accounts of other skulls from Syria, we are indebted to Pruner-Bey and Dr Paul Langerhans. In a communication made in 1866 to the Société d'Anthropologie de Paris[1], Pruner-Bey describes a series of about sixteen crania, and it is interesting to note that twelve of these were collected under similar circumstances, and at about the same time as our Damascus specimen, so that there is reason to suppose that they belonged to individuals whose lives had been lost in the massacres. Of these twelve, three present features distinctly akin to those of Arab crania, while the remaining nine are as a series characterised by the

[1] *Bulletins de la Société d'Anthropologie de Paris*, 2e Série, tome i, p. 563.

great prominence of the glabella, in addition to unusually massive mastoid processes and nuchal crests. Now it is noteworthy that Pruner-Bey, while mentioning the brachycephalic character as a feature of the group, and speculating on the cause of the parieto-occipital flattening, which is also frequently present, yet concludes that the crania represent "le type sémitique de la branche syrienne," while admitting in the next words that "par leur structure massive, par leur volume et par le grossissement des traits de la figure, ils diffèrent sensiblement du crâne arabe."

He subsequently admits the possibility of the skulls having belonged to a mixed race, and suggests that two of them may have been those of individuals with Turkish blood in their veins. As a group, however, they could not be referred to a Turanian stock.

Now from this description I think that the Damascus skull would come well into line with the nine crania described as a group by Pruner-Bey, and it may be repeated that the circumstances under which they were procured were similar. But I do not think that from the published description Pruner-Bey is justified in the conclusion that the series represents the Syrian branch of the Semitic type.

Before continuing this discussion, it will be as well to refer to Dr Paul Langerhans' careful paper in the *Archiv für Anthropologie*, Band vii, 1873, entitled, "Die heutigen Einbewohner des Heiligen Landes." The author had at his disposal eight skulls from Es Salt, said to be relics of a skirmish between Government troops and Beduins. These specimens are not described in detail, as they are not considered of sufficiently authentic origin. Six other crania (Amman, Philadelphia) are considered to be of indubitable Beduin origin: these are dolichocephalic and less capacious than the Damascus cranium, and bear no general resemblance at all to that specimen. Dr Langerhans, it should be noted, finds a difference between the true Beduin skulls and those of the peasant population of Syria, the latter possessing somewhat larger skulls than the former.

From a perusal of Dr Langerhans' communication, it will be concluded that the Damascus cranium is very improbably that of a Beduin, and having excluded that contingency as completely as possible, we may turn to the characters of the skulls of Turks, remembering that Government (*i.e.* Turkish) troops were involved in the later stages of the "massacres," and that this consideration must not be neglected in forming an opinion of the nature of the Damascus cranium.

Taking the various descriptions of the Turkish cranium in their historical order we may note that *Vesalius* (quoted by Blumenbach, Hamy and others), in his *Corporis humani fabrica* (sixteenth century),

mentions the occipital flattening of the skulls of Turks, and remarks on the part played by the midwives in the artificial production of such deformity in infants (it is noteworthy that this deformation is mechanically produced in the skulls of new-born infants when the presentation, to use the language of the obstetrician, has been of the occipito-posterior variety).

Sandifort (*Tabulæ craniorum diversarum nationum*, eighteenth cent.) figures as his typical Turkish skull, a cranium with immensely prominent glabella reminding one of the Damascus and Nicosia specimens: occipital flattening is not a feature of the figure given by Sandifort.

Blumenbach gives a series of descriptive characters of the Turkish skull which is almost completely realised by the Damascus specimen (see quotation by Davis in *Thesaurus Craniorum*, p. 124, viz., "Calvaria fere globosa: occipito scil. vix ullo, cum foramen magnum pene ad extremum baseos cranii positum sit. Frons latior. Glabella prominens").

[*Carus* figures a Turkish skull, but I have not been able to consult the reference.]

Retzius (*Ethnologische Schriften*, 1864) figures (Plate III, fig. 6) the cranium of a Turk considered to be of typical form: the parieto-occipital flattening referred to by Blumenbach is well seen. Retzius places the Turks in his division "Brachycephalæ orthognathæ."

Davis (in the *Thesaurus Craniorum*), from the consideration of two crania of Turks in his possession, comments favourably on the accuracy of Blumenbach's description.

Weisbach, in 1873 (*Mittheilungen der Anthropologischen Gesellschaft in Wien*, p. 220) gave a description of the cranial forms of the Turks, based on the examination of about seventy crania from the suburbs of Constantinople. He admits (cf. Hamy in *Crania Ethnica*) that there may be included crania of "Albanesen, Tscherkessen, Syrier, Araber," but he excluded all that gave any evidence of negroid affinities. He figures a skull somewhat resembling the Nicosia specimen. Weisbach concludes from his observations that "Der Schädel der Turken ist mithin mittelgross, schwer (dick knochig), kurz, hoch, relativ breit, in sagittaler und coronaler Richtung sehr stark gewölbt"—all of which features are reproduced in the Damascus skull with the exception of the cranial capacity which renders necessary the substitution of the term megacephalic for "mittelgross."

Flower (*Catal. Roy. Coll. Surg.*), however, records the capacities of two crania of Turks, and these are respectively as great as and greater than that of the Damascus specimen. Capacities of over 1,600 c.c. are also quoted by other authors.

Hamy in *l'Anthropologie*, 1895, insists on the "aplatissement pariéto-

occipital commun à tous les Turcs" and the development in vertical height: and the same author in *Crania Ethnica* (wherein an extensive bibliography will be found), gives a remarkable note in describing the southward expansion of the Turks into Syria, where they are said to have produced a marked influence as far as "la montagne des Ansariés" and "les Yéhalines." "La montagne des Ansariés" may be presumed to be the range of that name to the north of the Lebanon. The note just reférred to deals with the characters of skulls measured by M. León Cahun, who obtained them when on a scientific mission to "la montagne des Ansariés." The quotation runs as follows: "Cinq crânes d'Ansariés de Kerdaha près Calbié sur sept recueillis par le voyageur, offrent la déformation pariéto-occipitale plus accusée à droite qu'à gauche. Ils ont en commun l'indice 84·57 diam. a-p. 175 diam. tr. max. 148." And certainly the specimen figured in *Crania Ethnica* is not lacking in other resemblances to the Damascus cranium, in which, as has been already indicated, the parieto-occipital flattening is more accentuated on the right than on the left side (just as in the Ansariés). The religion which has gained their peculiar name for the Ansariés seems to have been practised in Northern Syria for the last thousand years (cf. Lyde, *The Asian Mystery*, p. 67). Lieut. Walpole (*The Ansayrii*, vol. iii, p. 342) indeed suggests that they are referred to even by Pliny, and adds a note as to their physical appearance, "They are a fine large race with more bone and muscle than is generally found among Orientals: browner than the Osmanlee but lighter, fairer than the Arab." Walpole moreover recognises that their numbers have been recruited from very various ethnical sources.

Dr v. Luschan has in the *Archiv für Anthropologie* (Bd. xix, 1891) recorded the results of an enquiry into the cranial forms of inhabitants of Lykia, and finds that brachycephalic crania are there as frequent as the dolichocephalic varieties; he further refers certain hypsi-brachycephalic crania to what he calls an "armenische" or "armenoide" race: as similar skull-forms occurred on two occasions in very ancient graves, v. Luschan bases hereon a theory of the existence of an aboriginal "Armenian" race in this region. The Damascus skull agrees with some of these skulls from Lykia in being hypsi-brachycephalic, and with the "Armenian" skull figured in Dr von Luschan's paper (fig. 17) in its general contour.

Professor Sergi in his *Ursprung des Mittelländischen Stammes* describes various skull-forms occurring on the Mediterranean shores, but the Damascus skull can be referred to no form considered by Sergi to be characteristic of the "Mediterranean" race: on the other hand its rotundity and elevated character assign to it a place among the crania

compared by Sergi (*Ursprung des Mittelländischen Stammes*—Deutsch von Dr Byhan, p. 134) to Mongolian skulls.

Finally, the frequency of occurrence of brachycephalic crania in Asia Minor is further insisted upon by Elisyeef (who found the average breadth index to be 86, the number of observations being 143) and Chantre (breadth index: average of 120 observations on males, 84·5). The two latter observations are quoted by Ripley in his *Races of Europe* (1899).

The attempt to sum up the evidence may now be made, and it will, I think, lead to the following conclusions:—

(i) That the Damascus cranium is very similar in general contour and especially in the peculiar character of its asymmetry to certain skulls from "la montagne des Ansariés" (one of which is figured in *Crania Ethnica*, Plate LXXXV, figs. 3 and 4), immediately to the north of the Lebanon range.

(ii) That the Damascus cranium resembles nine of the skulls obtained in Syria under similar circumstances by M. Girard de Rialle, and described by Pruner-Bey in the *Bulletin de la Société d'Anthropologie de Paris* (1866, p. 563 *et seq.*).

(iii) That the Damascus cranium resembles skulls described or figured by Sandifort, Blumenbach, Davis, Weisbach, Flower, Hamy, *et aliis*, as typical Turkish crania, and also, in certain features, the skull in the Museum at Nicosia.

(iv) That the description of the Damascus cranium as representing a form common among peoples of Turkish origin, is not prejudiced by the fact that Pruner-Bey ascribed the nine skulls (referred to in conclusion (ii) as similar to the Damascus cranium) to the Syrian branch of the Semitic type, considering they did not correspond to any Turanian type. For as regards the Syrian branch of the Semitic type, the features in which the said nine skulls resemble that somewhat vaguely defined cranial form are not clearly stated by Pruner-Bey, whereas the clearly specified features wherein they depart from the Arab type of cranium are the very characters which one would from the study of the various works quoted, bring together as typical of the skulls of Turks.

(v) That if the argument in No. (iv) is sound, the Damascus skull and skulls like it might warrantably be described as Turanian, as this type is understood by some authors (*ex. gr.* von Hölder), but that as descriptive of cranial forms, such

terms as Turanian and Semitic are better avoided until they have been more clearly defined.

(vi) Lastly, that large, heavy-browed massive skulls with occipital flattening occur in many localities adjacent to the eastern shores of the Mediterranean; they seem to be associated with the Turkish inhabitants of those regions, and when they combine a high altitudinal index with distinct brachycephaly, are compared by Sergi to "Mongolian" crania. They thus come into line with certain crania found in the Crimea by Demidoff (cf. *Exploration de la Russie méridionale*), in Kurdistan (cf. *Crania Ethnica*), and lastly, they have some points of resemblance to a skull found in Eastern Turkestan which is mentioned in an elaborate memoir by Professor Rudolf Hoernle in the *Transactions of the Royal Asiatic Society*. The latter specimen, which was found in a mound with a number of MSS., is a short, broad skull with the same parieto-occipital flattening as the Damascus skull, from which, however, it differs in being much less massive. It is to be hoped that future research will enable the whole of the lacunæ between the foregoing examples to be filled up, till a completely imperceptible transition from one form to another shall be demonstrable.

Dimensions, etc., of a Syrian Skull. From near Damascus, picked up after the massacre of 1860:

Maximum length	180
Ophryo-iniac length	180
Maximum breadth	148
Bi-auricular breadth	131
Bi-stephanic breadth	120
Bi-zygomatic breadth	144
Measurement from Basion to Glabella	116
,, ,, ,, Nasion	107
,, ,, ,, Alveolar point	105
,, ,, ,, Bregma	152
,, ,, ,, Obelion	145
,, ,, ,, Lambda	119
,, ,, ,, Inion	78
,, ,, ,, Opisthion	37
Orbital height	34
Orbital breadth	43
Nasal height	57
Nasal width	25
Palato-maxillary length	57

Palato-maxillary breadth	68
Jugo-nasal arc	115
Jugo-nasal width	101
Horizontal circumference	526
Radii:	
Auriculo-Alveolar	106
-Nasal	101
-Glabellar	108
-Bregmatic	139
-Obelial	135
-Lambdoid	112
-Iniac	81

INDICES.

Cephalic (or breadth)	82·2
Altitudinal (or height)	84·4
Alveolar	98·1
Orbital	79·1
Nasal	43·8
Palato-maxillary (Flower)	119·3
Naso-malar	113·8
Facial (Kollmann)	53·4
Stephano-zygomatic	83·4
Other measurements and indices:	
Nasi-alveolar length	77
Angle of Cloquet	68°
Angle of Jacquart	74°
Cubic capacity	1,650

The illustrations accompanying this note are :—

Fig. 1.—The Damascus Cranium in Norma Lateralis: left side.

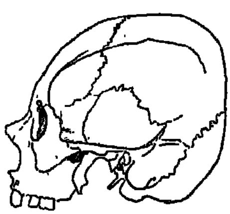
„ 2.—Outline tracings of four crania all reduced to the same dimensions (*i.e.*, the naso-lambdoid line is identical throughout the series).

No. 1.—Simple deformation in a Maronite skull (from Topinard).

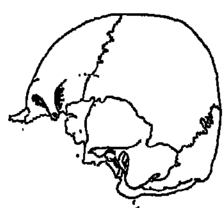
„ 2.—Specimen 1237 in the Cambridge Anatomical Museum [a skull from Bassus Tower, Syria, forming part of the Tyrwhitt Drake Collection].

„ 3.—A skull in the Nicosia Museum, Cyprus.

„ 4.—The Damascus skull.



No. 1.



No. 2.

No. 3.

No. 4.

DESCRIPTION OF TWO SKULLS FROM NAGYR.

To the Cambridge University Collection there have recently been added two skulls from the capital of Nagyr, a small state in Central Asia[1]. By the kindness of Prof. Macalister I am enabled to give the following description of them:—

The skulls are numbered 1204 and 1205 respectively, in the Cambridge catalogue, the measurements, which were made with Flower's craniometer and a steel tape, are given in millimetres.

The skull 1204 is a female skull whose sex is indicated by an inconspicuous glabella, faintly defined superciliary ridges, temporal ridges and external occipital protuberance, with slender zygomatic arches. It is in a good state of preservation, the left side being a good deal more bleached than the right; no remains of skin or adhering hairs are to be seen. The more conspicuous parts missing are as follows: the lower jaw, all the teeth except four (first and second molars on either side), the lacrymal bones, the hamular processes of the internal pterygoid plates, the left styloid process (that on the right side though quite short (8 mm.) does not appear to have been broken off). The os planum of the ethmoid is much damaged on either side.

This skull is fairly symmetrical; the right parietal eminence is the more pronounced; on the left side is a parietal foramen.

At the right asterion are three large wormian bones, and at the left asterion a single one. The temporal ridge of the right side is more pronounced than that on the left (and the remaining molar teeth of the right side have larger dimensions than those on the left). There is a post-condylar foramen of large size on the right side, in front of and external to which is a remarkable eminence perforated at the top where the bone is attenuated. This is due to pressure of the right sigmoid sinus causing absorption of the bone and consequent dilatation of the sinus in this region (just before its termination). The anterior condylar foramina are large but neither is subdivided. The foramen

[1] The skulls were obtained by Sir W. M. Conway, during his late mountaineering expedition in the Hindu-Kush district.

spinosum is incomplete on either side, but this is possibly due to injury. The nasal bones are curiously asymmetrical. The suture between them is oblique in direction and at its highest point is 3 mm. to the left of the remaining trace of the metopic suture, whereas its lower end reaches to the middle line of the face; the width of the nasal bones at their upper ends varies correspondingly, for the right nasal bone is 6 mm., and the left 4 mm. wide at this end. The anterior opening of the nose is also asymmetrical, the right superior maxillary bone being hollowed out to a much deeper level than is the left; the septum of the nose is strongly deflected to the left.

The dentition has been perfect. The premaxillo-maxillary suture is still visible; the sagittal suture shows no signs of synostosis nor has the spheno-basilar suture yet synostosed. These facts assign an age of from 18 to 21 years to this skull.

The general shape and contours are of a refined type, the forehead being high, no prominent glabella, distinct frontal eminences with a slight flattening immediately posterior to these. The curve of the vault reaches its culminating point just at the bregma and begins to descend some 40 mm. posterior to this point. From the obelion, the posterior curve continues to the lambda, after passing which it is interrupted by a considerable bulging out in the region immediately above the inion.

In norma verticalis the skull is seen to be cryptozygous and dolichocephalic. The breadth-index, 69·94, is remarkably low. There is a depression at the level of the upper part of the temporal ridge, below each parietal eminence, below which again is an eminence above the mastoid process and it is at this level that the breadth of the skull is greatest. The transverse arc is quite regular, without flattening or upraising at the vertex. The mastoid processes are small, in fact feminine, and the same description applies to the face generally.

The coronal, sagittal, and lambdoid sutures are of moderate complexity. In the coronal suture just above the left stephanion appear the remains of a wormian bone, interrupting the suture for some 15 mm.; ossification has taken place around the circumference for about half its extent. The sagittal suture becomes more simple for a space of 25 mm. in the region of the obelion. The lambdoidal suture is characterised by the wormian bones already referred to. On the right side there is a large foramen in one wormian bone and another in the base of the mastoid process.

On the left side are two foramina near the base of the mastoid process, formed by the juxtaposition of notches in the borders of the temporal and occipital bones respectively. The metopic suture persists for a distance of 2 mm. only.

This skull weighs 419 gms.; decidedly light. The cranial capacity (using No. 8 shot) is 1470 c.c., an exceptionally high figure for a female skull. As regards the face; the orbits are mesoseme, and droop slightly and externally; there are shallow supra-orbital notches. The nose is mesorrhine and the lower margins of its anterior opening are rounded, the spine is small and the profile outline is nearly straight. There is a well marked depression immediately below the infra-orbital foramen. The palate is distinctly elliptical, of no great depth; the posterior nares are small. The occipital condyles are small, their inner and anterior lips are prominent and not much elevated above the plane of the foramen magnum.

An internal occipital protuberance can be felt and the torcular herophili seems to have been situated on its left side.

Turning now to the skull No. 1205, a series of contrasts present themselves. No. 1205 is a male skull—the prominent glabella, superciliary ridges, occipital protuberance and mastoid processes as well as the stoutness of the zygoma, indicate this. It is not in so good a state of preservation as is No. 1204, and the following parts are wanting:—The lower jaw, styloid processes, right internal pterygoid plate, left hamular process, left inferior turbinated bone, the posterior part of the vomer and the left lacrymal bone. Three teeth alone remain and the alveolar arch has undergone a considerable amount of absorption.

The most striking features are: the rough and uneven surface; very marked dolichocephaly (index 68·28), considerable flattening in the region of the obelion, where there are two parietal foramina; the skull is also slightly plagiocephalic. There are two wormian bones on the right side below the asterion. The appearance of the condyles is noticeable. The left condyle is subdivided by a somewhat oblique sulcus so as to present two oval articular areas. The articular surface of the right condyle is constricted, at about the same level, but is not completely interrupted.

There is a post-condylar foramen on the right side. The outer pterygoid plates are much everted and on the left side a bridge of bone connects the base of the external pterygoid plate with the base of the spine of the sphenoid. This is the superior variety of the pterygo-spinous ligament ossified. On the right side a depression exists immediately external to the external pterygoid plate.

The age of this skull is not very closely indicated. The third molars on either side have been lost and their alveoli closed, and since ossification is just commencing in the sagittal suture in the region of the obelion, it may be assumed that the person had passed middle age. The general contour is characterised by the very prominent

glabella, with a depression immediately above it, the curve of the vault reaches its maximum about 25 mm. posterior to the bregma, and the region of the obelion is much flattened as has been already remarked. Beyond the lambda there is a considerable bulging out of the occipital bone, reduced at the occipital protuberance, whence a well-marked occipital crest descends to the opisthion. Altogether this contour is somewhat irregular, contrasting strongly with that of No. 1204.

On a horizontal plane, *i.e.*, in norma verticalis, the skull is seen to be phænozygous, and its left side is somewhat flattened. The transverse arc in the region of the coronal suture is quite regular. Posterior to this, the highest point of the arc is seen to be at a distance of 17 mm. to the left of the middle line; still more posteriorly this arc is interrupted by the flattening in the region of the obelion.

The sutures are moderately complex. The outline of the squamous portion of the left temporal bone overlapping the parietal bone, is noticeable as it culminates in a sharp spine vertically above the external auditory meatus; on the right side the outline of the corresponding suture is more regular. The remaining teeth are of large size and show signs of having been well used. The cranial capacity, 1375 c.c., and the weight, 667 gms., afford contrasts with the skull No. 1204.

The orbits are mesoseme; though their respective indices differ considerably; there is a supra-orbital notch on the right side and a supra-orbital foramen on the left side. The lower margins of the anterior nares are rounded; the nose is mesorrhine, inclined to the leptorrhine type: the nasal spine is large. The alveolar index shows that the skull is orthognathic, but is not reliable owing to the absorption of the alveolar arch, the effect of which, aggravated by the length of time that has elapsed since the skull was interred, is to reduce the basi-alveolar length. The palate seems to have been elliptical. Traces of a premaxillo-maxillary suture remain, but these are lost near the middle line of the palate.

There is a somewhat large foramen in the basi-occipital on the lip of the foramen magnum midway between the condyles, corresponding to the attachment of the suspensory ligament of the odontoid process of the axis. The internal occipital protuberance corresponds in position with the external, and the torcular herophili was situated on the right side of this point.

Such are the characters of the two skulls. The contrasts between them arise rather from differences of sex and age than from any other causes. Their type is Caucasian in spite of the low figures representing their respective cephalic indices. There may be compared with them the following examples:—

First, the series of skulls from the Hindu-Kush, described by Dr Garson in 1888 (i.). These came from localities at distances from Nagyr of thirty to one hundred miles. Of the five skulls two are dolichocephalic, the remainder are mesaticephalic; the most dolichocephalic had a breadth index of 72·3, and a general comparison of their measurements with those of the two Nagyr specimens brings to light a general resemblance[1].

Secondly, there are two skulls from Srinagar briefly described by Captain Cunningham (ii.) in 1854. Sketches of the two skulls (a male and a female) are given, and the difference between these skulls and the shorter skulls with wider zygomatic arches of tribes more Mongolian in type is noticed. No measurements, however, are given. From the sketches, a general resemblance to the Nagyr skull is apparent, more particularly as regards the shape of the palate in the female skull. The same sketches are referred to in the *Crania Ethnica* of Quatrefages and Hamy.

In the third place, come the skulls presented to the Société Anthropologique de Paris by M. de Ujfalvy in 1882 (iii.); they are described as having been obtained from a Mussulman cemetery in Kashmir. A committee was appointed to examine and report on the skulls, but so far no report has been available.

Turning to measurements on living persons there may be mentioned M. de Ujfalvy's account of a native of Hunza whom he measured (iv.). This man was dolichocephalic with a cephalic index of 73·84. To obtain the corresponding index for the skull itself, two units should be subtracted according to Broca (*Bull. Soc. d'Anthrop.*, 2nd series, vol. iii. 1868). The resulting index of 71·84 is quite comparable with the foregoing instances. M. de Ujfalvy at the same time took measurements of a native of Naghar (? Nagyr), but these were not placed on record in the Society's report.

Such are the cases for direct comparison. On looking through the catalogue of the museum of the Royal College of Surgeons, the following crania from Hindustan seemed to present points of similarity to those from Nagyr, viz., Nos. 632, 634, and 670; their measurements have been tabulated with those of the Nagyr skulls (Table II).

As to the character and mode of life of the inhabitants of Nagyr, there is some little diversity of opinion expressed by travellers. The name is almost invariably coupled with that of Hunza; Nagyr and Hunza are the chief towns of two small states (of the same names

[1] Dr Garson has remarked the prominent brow-ridges common to the Nagyr skull, No. 1205, and to the Hindu-Kush skulls, also on approximation of the cranial capacity in one case.

respectively) and are situated on opposite sides of a tributary of the Gilgit river. The whole district is also referred to as Kanjut, and is on the frontier between Kashmir and the Pamirs. Of the inhabitants of Hunza but one opinion is expressed: that they are dangerous brigands. This description has been extended to the natives of Nagyr by some writers; others assign to them a more peaceful occupation.

Of modern writers, the traveller Vigne, in 1842, referred to the gold-washing carried on at Nagyr, and also to the renowned beauty of the women (v.).

Capt. Cunningham (*op. cit.* (ii.) p. 38) says, "Hunza-Nager is a small tract of country situated on the upper course of a large feeder of the Gilgit river."..."I presume that this district was formerly inhabited by the Dards, and that they were displaced by the Kirghiz nomads." The cranial characteristics of the Kirghiz described by Topinard (*Revue d'Anthropologie*, 1887) do not support this view.

In 1869 the late Dr Leitner made the first of a remarkable series of contributions to the literature of this subject. In a communication (vi.) to the Anthropological Society in this year (1869), Dr Leitner stated that, "Khajuna is the remarkable language of Hunza and Nagyr."..."Although not unacquainted with a variety of languages, I was unable to find any connection between the language of Hunza-Nagyr and that of any other country."..."The people of Dardistan seem to have the remnants of an old civilization somewhat resembling the purest parts of the Aryan polity. This has, however, been obscured by the introduction of Mohammedanism into the country."..."The position of woman is in every respect higher than among the Hindus."

Other writings of the same author describe the Nagyris as "short and stout, and fairer than the people of Hunza," who are described as "tall skeletons," and are "desperate robbers," and again "the people of Nagyr are a comparatively mild race; they carry on goldwashing," with historical references to this occupation of the Dards by Herodotus, Ptolemy, and native Kashmirian chroniclers (vii.).

Other accounts (viii.) published by Dr Leitner (including the *Hunza and Nagyr Handbook*, 1889) give additional information, but are perhaps rather of philological interest. In 1891 (ix.), reproductions of photographs of Nagyris were published, and it was stated that "Hunza and Nagyr are but one tribe divided into two rival sections." Still more recently the difference in character of the two are strongly insisted upon (x.). Dr Leitner has published a series of measurements of this people which will doubtless be of much value.

Other descriptions of the Dards are given by Drew (xi.). They are supposed by him to have come from the North and North-east (reference

to Sir G. Campbell's work being made). The same author (xii.) again says: "Whether we judge from language or physiognomy, the conclusion is inevitable that the Dards are an Aryan race." Their castes are enumerated; the Shîns and Yashkuns being regarded as the most ancient, and as composing the race, called Dard, that invaded the country, and took it from earlier inhabitants. The Yashkun without any Shîn are found in "Nagar[1]." Gen. Maclagan (xiii.) considers these tribes as Aryan. Lieut. Gordon (xiv.) states that the people of Hunza and Nagyr are alike in character and religion and describes them as having "an evil reputation with their neighbours, as robbers and man-stealers, treacherous, cruel, and cowardly."

The description of a native of Hunza, by M. de Ujfalvy, has been referred to (iv.). M. de Ujfalvy thought this man resembled the natives of Herzegovina[2]. The features were thus described "des sourcils épais allant sans interruption d'une bosse sourcilière à l'autre; des bosses sourcilières peu prononcées, et la dépression entre le nez et la glabelle, presque nulle"; the profile resembled that of a Greek statue.

In a review of Dr de Ujfalvy's *Ethnologische Beschreibung der Völker Central-Asiens*, the author's classification of these races is appended, in which the "Khadschuna" are placed in a subgroup under the group "Die Hindu-Kusch-Inder"; while "Die Darden" fall within another subgroup under the same group (xv.).

Sir W. W. Hunter (xvi.) thus notices this people, "The people of Hunza and Nagyr belong to the caste called Yeshkún by the Shîns of Gilghit, but known among themselves as Búrish...Mohammedanism sits but loosely upon them"; while Dr G. Capus (xvii.) refers to Tomaschek's opinion that "la peuplade des Kachounas dans le Dardistan sont un reste de ces aborigènes non-ariens parce qu'ils possèdent, ainsi que les Kafirs, les Daradas, et certains Tadjiks de la montagne, une méthode de compter vigésimale." A general account of the tribes of this district is given by Prof. E. E. Oliver (xxi.), and reference to the appearance of the Hunzas by Mr E. F. Knight (xxii.).

Dr Leitner, as has been said, described the language spoken by the inhabitants of Hunza-Nagyr as unconnected with any of the neighbouring dialects. On this subject the following light was thrown by Dr Hyde Clarke (xviii.). "This language (the Khajuna) was for some time un-

[1] Sir W. M. Conway, however, says "the people are something of a mixture (Yashkuns, Shînas, and lower caste of earlier folk)." Letter to Prof. Macalister.

[2] The Hunza man had a cephalic index of 73·84; whereas in a summary of the Anthropology of Herzegovina, Dr Weisbach (Vienna) describes the natives of the latter country as Hyper-brachy-cephalic (index 87·2). *Revue d'Anthrop.*, 3e Série, tome iii, 1888, p. 742.

classified since it has no neighbouring congeners. The group of languages furnishing the key to it has representatives in Abyssinia, Caucasia, and the Indian Archipelago; a Siberian class and two American classes are also related, as is also the Rodiya or language of the Pariahs of Ceylon. This group, the Sibero-Nubian, must have had possession of the whole of India before the advent of the Dravidians." Col. Biddulph classifies the languages of Dardistan thus: (1) Boorishki or Khajuna... the language of the Boorish or Yeshkuns spoken in Hunza, Nager, and Yassin; (2) Shina, spoken at Gilgit; (3) Khowar, the language of Chitral (xix.).

M. de Ujfalvy says the language of Hunza-Nagyr is non-Aryan, and (presumably) separates the "Khadschuna" from other Dards. He refers to the opinions of Tomaschek and Biddulph, as to the meaning and origin of the terms "Khazunah" and "Burich" respectively (xx.).

In accordance with the affinities of the Khajuna language as described above, a comparison has been instituted between the measurements of the Nagyr skulls on the one hand, of those of various natives of Ceylon on the other. A general review of the figures shows that the two Nagyr skulls resemble each other more closely than any of the skulls compared with them (see Tables III and IV); the most interesting comparison is afforded by the data for the Rhodias of Ceylon (presumably the Rodiya mentioned by Dr Hyde Clarke).

Table I.

(Measurements of the Skulls are in millimetres.)

Indices	Skull, ♀ Nagyr, 1204	Skull, ♂ Nagyr, 1205
(Bi) Cephalic	69·94	68·28
(Hi) Vertical	69·94	70·43
(Ai) Alveolar	95?	97·10?
(Oi) Orbital	86·43 (R)	82·06 (R)
(Ni) Nasal	50	52·72
Stephano-zygomatic	97·5	82·4
Palatine	115·4	—
Naso-malar	110·50	113·33

TABLE I.—*continued.*

	Skull, ♀ Nagyr, 1204	Skull, ♂ Nagyr, 1205
Cranial Capacity	1470 c.c.	1375 c.c.
Maximum Antero-posterior Length	183	186
Maximum Transverse Diameter	128	127
Basi-alveolar Length	95 ?	101 ?
Basi-nasal Length	100	104
Basi-bregmatic Length	128	131
Length: Basion to Inion	63	87
,, ,, Opisthion	31	38
,, Opisthion to Glabella	137 ?	144
,, Nasi-alveolar	60	75 ?
,, of Spheno-parietal suture	10	15 R 17 L
Breadth of Foramen magnum	27	29
,, from Pterion to Pterion	104	112
,, from Stephanion to Stephanion...	117	103
,, from Asterion to Asterion	105	104
,, Bi-zygomatic	120	125
,, Bi-maxillary	89	96
,, Inter-auricular	107	113
,, Minimum Interorbital	19	22
,, Minimum Frontal	101	95
,, Bi-orbital (at Fronto-malar suture)	102	101
Orbital Breadth	37	39
Orbital Height	32	32
Nasal Breadth	22	29
Nasal Height	44	55
Maximum Length of the Palate	52	57 ?
Maximum Breadth ,, outside arch	60	64
,, ,, ,, inside arch	42	45 ?
Arcs:—		
Antero-posterior curve. Frontal arc	129	123
Parietal arc	125	122
Arc from Lambda to Inion	88	65
,, Inion to Basion	63	94
,, Inion to Opisthion...	32	55
Supra-auricular arc	302	307
Jugo-nasal arc...	105	110
Breadth at external border of Orbits: for Naso-malar Index	95	98
Horizontal circumference	508	507
Posterior Nares:—		
Maximum Breadth (between Intl. Pterygoid plates)	27	30
Height	23	23
Length of Interpalatine suture	14	17
The Superior Maxillary Bone:—		
Maximum Height	57	72 ?
Mean Height	35	47
Minimum Height	17	23

TABLE I.—*continued.*

DIMENSIONS OF TEETH. Skull, ♀ Nagyr, 1204.

	Antero-posterior diameter	Transverse diameter
On the Right:—		
Molar 1	10	11
Molar 2	9	10
On the Left:—		
Molar 1	7	10
Molar 2	8	8

Skull, ♂ Nagyr, 1205.

	Antero-posterior diameter	Transverse diameter
On the Left Side:—		
2nd Premolar	7	8
1st Molar	11	11
2nd Molar	10	10

TABLE II. COMPARISON OF MEASUREMENTS OF SKULLS FROM NAGYR with those of Skulls from the Hindu-Kush described by Dr Garson (i.) and with isolated examples of Dolichocephalic Skulls which were obtained from other parts of Hindustan.

Skull	Horizontal Circumference	Maximum Length	Maximum Breadth	Breadth Index	Height	Height Index
Nagyr (1204)	508	183	128	69·94	128	69·94
Nagyr (1205)	507	186	127	68·28	131	70·43
Gound: No. 634 in the catalogue of the Roy. Coll. Surgeons ...	505	188	127	67·6	134	71·3
Hindu-Kush B	515	181	136	75·1	128	70·7
,, C	483	177	128	72·3	123	69·5
,, D	500	178	134	75·8	129	72·5
,, E	508	176	140	79·5	127	72·1
,, F	490?	179	133	74·3	128	71·5
M. de Ujfalvy's Hunza (iv.)	?	?	?	73·84 (71·84)	?	?
Skull from Madura, 670 in catalogue of Roy. Coll. Surgeons	507	184	124	67·4	143	77·7
Skull of a Mussulman, 632 in catalogue of Roy. Coll. Surgeons	512	189	125	66·1	132	69·8

TABLE III. COMPARISON OF MEASUREMENTS OF NAGYR SKULLS with those of Living Rhodias.

Skull	Craniometric		Anthropometric	
	Nagyr, 1204 (female)	Nagyr, 1205 (male)	Rhodia (male)	Rhodia (female)
Antero-posterior diameter	183	186	190·66 (6)	181·66 (6)
Maximum transverse diameter ...	128	127	139·5 (6)	137·81 (6)
Cephalic Index	69·94	68·28	73·16	75·86
Horizontal circumference	508	507	541·16 (6)	544·66 (6)
Minimum frontal breadth	101	95	106·16 (6)	94·83 (6)
Bi-zygomatic breadth	120	125	120 (12)	
Bi-auricular breadth	107	113	117 (12)	
External Bi-orbital breadth	95	98	98·66	

The above measurements of Rhodias are given by M. Emile Deschamps in his account of "Les Veddas de Ceylan," in *L'Anthropologie* for 1891; photographs of male and female Rhodias are also given; in the profile view of a Rhodia chief the brow presents the same feature of prominent glabella with a depression immediately above it as does the male skull from Nagyr. The figures in the table above, when allowance is made for the difference between Anthropometric and Craniometric observations, afford some interesting comparisons; those of the respective horizontal circumferences being remarkable. Topinard (xxv.) states that for a skull with a circumference of 508 mm. (horizontal) there should be added 35 mm. to approximate to the corresponding anthropometric measurement. In the case of Nagyr, 1204, this would give 543 mm., and for Nagyr, 1205, the anthropometric equivalent would be 542 mm. The figures for male and female Rhodia heads are given above.

TABLE IV. COMPARISON OF MEASUREMENTS OF SKULLS FROM NAGYR with those of Skulls of Natives of Ceylon other than Rhodias.

Skull	Nagyr, 1204 ♀	Nagyr, 1205 ♂	Veddah ♂	Veddah ♀	Tamil ♂
city	1470	1375	1277 (22)	1139 (10)	1336 (13)
t Index	69·94	70·43	73·8 (21)	73·2 (10)	73·6 (13)
Nasal length	100	104	98·7 (18)	93·4 (8)	102·5 (13)
Alveolar length ...	95	101 ?	94·2 (16)	88·3 (8)	99·7 (10)
lar Index	95	97·10	95·2 (16)	94·5 (8)	97·7 (10)
al Index	86·43	82·06	89·2 (21)	89·4 (10)	86·7 (10)
orbital breadth	19	22	22·2 (21)	21·7 (10)	23·5 (13)
l Index	50	52·72	52·5 (21)	52 (8)	53·7 (13)
alic Index	69·94	68·28	71·6 (21)	71·2 (11)	70·8 (13)

The measurements of the Veddah and Tamil skulls are those given by Drs Paul and Fritz Sarasin (xxiv.). The numbers in brackets indicate the number of skulls whence the average is deduced.

Dr Deniker has most kindly communicated detailed measurements of the series of skulls of Kashmiris, presented to the Société Anthropologique de Paris by M. de Ujfalvy. The series comprises six skulls of males and three of females. Apart from measurements, Dr Deniker says that the prominence of the inferior nasal spine and the shape of the apertura pyriformis of the nose (that of an ace of hearts), are characteristic of this series. For the measurements the following arrangement exhibits the principal features, with which those of the skulls from Nagyr may be compared:—

MALE SKULLS.

Skull	Breadth Index	Height Index	Nasal Index
Nagyr, 1205	63·28	70·43	52·7
Average of five male skulls from Kashmir ...	73·28	70·7	48·3
Extremes	75·6 70·6	73·4 65·8	54·7 41·5
Kashmir skull, No. 9 (male)	65·6	67·2	?

No. 9 is described separately, as Dr Deniker suspects deformity.

FEMALE SKULLS.

Skull	Breadth Index	Height Index	Nasal Index
Nagyr, No. 1204	69·94	69·94	50
Kashmir, No. 5	72·3	74·7	51·1
,, No. 6	74	70·7	43·8
,, No. 4 (child ?)	75·9	77·7	54·5

The conclusion is, that the skulls from Nagyr might well fall into a group including these skulls from Kashmir, except as regards their breadth-index, though even this pronounced feature is surpassed by one of the Kashmir skulls. It seems probable that this may prove to be a specific distinction of skulls from Hunza-Nagyr.

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(iv.) M. de Ujfalvy. *Bulletins de la Société d'Anthropologie de Paris*, 1881, p. 600.

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DESCRIPTIVE NOTES WITH THE PRINCIPAL MEASUREMENTS OF A SKULL FROM CENTRAL ASIA. MACARTNEY COLLECTION.

THIS is a brachycephalic male skull: the parietal eminences are very prominent, with flattened areas anterior and posterior to them. It is of middle age judged by the conditions of teeth and sutures. Prognathism not marked. In norma lateralis only slight glabellar prominence is seen: the curve is regular to the obelion, whence as in many brachycephalic skulls it turns sharply down, to again change its direction at the external occipital protuberance which is represented by a sharp uncinate process. The conceptacula cerebelli are not prominent. Muscular ridges and crests other than the occipital are but slightly developed.

In norma facialis, the face appears broad, but owing to the damaged character of the specimen this is not certain. The orbit appears moderately high with sharp margins. The canine fossæ are shallow.

The lower margin of the apertura pyriformis nasi is indistinct and the ridge representing the canal for the anterior superior dental nerve is all that demarcates the inferior nasal from the facial surface.

The palate is small, the tuberculum however being of large relative dimensions.

A certain degree of "lipping" of the margins of the occipital condyles is observable.

The prominence of the parietal eminences is well seen in norma occipitalis, the mastoid processes being small and somewhat incurved.

The specimen shews distinct resemblances to the "Sarmatian" type of von Hölder.

The teeth are small and worn down.

The endocranium—nothing remarkable is to be noticed.

Lengths:	Maximum	163
	Ophryo-occipital	161
	Ophryo-iniac	161
	Occipito-spinal	176
	Occipito-alveolar	183 (?)

Breadth:	Maximum transverse	141
	Bi-stephanic	114
	Bi-mastoid	?
	Bi-auricular	?
	Minimum interfrontal	87
	External bi-orbital	96
	Inter-orbital	?
Horizontal circumference		481
Face:	Height: Ophryo-alveolar	90
	Nasi-alveolar	70
	Nasal height	49
	Nasal width	? 26
	Orbital height	33
	Orbital breadth	35 (?)
Basi-glabellar length		99
Basi-nasal length		92
Basi-alveolar length		? 92
Basi-bregmatic length		136
Basion to Obelion		122
Basion to Lambda		107
Basion to Inion		65
Basion to Opisthion		38
Diameter (transverse) of foramen magnum		29
Palate: Length (Flower)		50
Breadth ,,		64
Bi-zygomatic breadth		122 (?)

INDICES.

Breadth	86·5
Height	83·4
Height-Breadth	96·45
Alveolar	100 (?)
Nasal	53·1
Orbital	94·3
Palato-maxillary	78·1
Stephano-zygomatic	93·4
Facial (Kollmann's)	57·4
Facial (Pruner Bey)	135·6

AN ACCOUNT OF SKULLS FROM MADAGASCAR IN THE ANATOMICAL MUSEUM OF CAMBRIDGE UNIVERSITY.

THE University collection contains three skulls from Madagascar, of which one was presented by the Rev. C. P. Cory, the other two by the Rev. J. W. Mathews. The donor of the first writes to say that he obtained the specimen himself from the east coast, at some risk, for the natives venerate the dead, and is of opinion that it belonged to an individual of one of the woolly-haired tribes, probably the Betsimisaraka. The other two skulls are labelled "Skull of a Betsileo" and "Skull of a Hova" respectively[1].

In no case does the mandible accompany the skull; the principal features of the latter are as follows:—

The first, that of a native of the Betsimisaraka or Betsimsarak tribe, has been embedded in vegetable mould, some of which still adheres to its base, and which has stained the bone a brownish-red colour. The zygomatic arches, pterygoid plates, and alveolar border have sustained some damage. The absence of strongly marked muscular ridges and other features distinctive of sex causes some hesitation in pronouncing on this point, but the balance of evidence appears to indicate a female; the remaining teeth are of large size and being but little worn indicate that the individual was in the prime of life.

The profile view (norma lateralis) shows slight prognathism; the general outline of the face is somewhat flattened, the naso-frontal depression being quite shallow, and the forehead high; the contour of the cranial vault is uninterrupted by flattening, and forms a continuous curve from nasion to inion. On either side, the frontal and temporal bones are separated at the pterion by a narrow spur-like

[1] The Betsimisaraka tribe occupies the east coast, the Betsileo the central southern districts.—Sibree.

projection of the parietal bone. The conceptacula cerebelli are large and bulging.

In norma facialis, narrowness is a notable feature, the orbital axes droop slightly externally, the canine fossæ are remarkably shallow, and the lower margins of the apertura pyriformis of the nose are indistinct.

In norma basilaris, the palate is seen to be wide and deep and its anterior foramen of considerable size. The occipital condyles are small, rounded, and everted, and are situated towards the anterior part of the lip of a large foramen magnum.

The specimen labelled "Skull of a Betsileo" is that of an adult male. Like the preceding it has been stained by the action of vegetable juices, and is in a fairly good state of preservation, though the zygomatic arches and the internal skeleton of the nose have been somewhat damaged. The sex is unmistakably indicated by the prominences of the glabella and inion, as well as by the prognathous upper jaw and the large size of the remaining teeth. The cubical capacity is also considerable.

In norma lateralis, the prognathism appears to be mainly sub-nasal, the profile of the face is somewhat flattened and the fronto-nasal depression shallow. The curve of the cranial vault as in the preceding specimen is uninterrupted by flattening from ophryon to inion. The sutures, as a whole, are remarkably free from synostosis, and there is a wormian (epipteric) ossicle at each pterion.

In norma facialis a slight degree of scaphocephaly is noticeable, and the face is long and narrow with sharp-bordered orbits whose axes are nearly horizontal. The nasal bones are short and flat, the nasal processes of the maxillæ massive, the canine fossæ remarkably shallow, and the inferior margins of the apertura pyriformis of the nose are replaced by gutters (*gouttières simiennes*).

In norma basilaris, the width and shallowness of the palate with moderate tubera maxillaria are to be noted. On the right side the foramina spinosum and ovale are confluent.

Description of Figures.

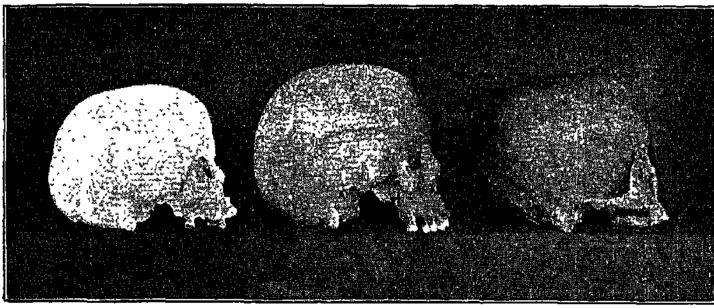
Fig. 1.—Profile views (norma lateralis) of { skull of Makua (to the left).
skull of Betsimisaraka.
skull of native of Mobangi (to the right).

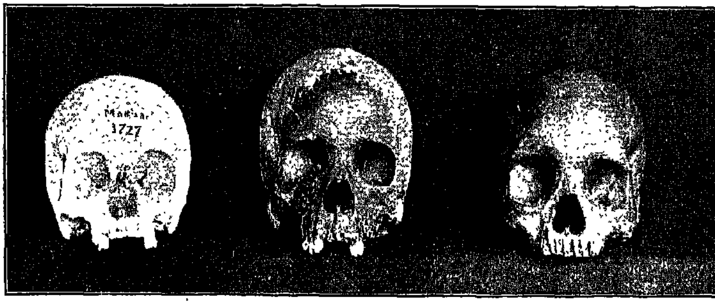
Fig. 2.—Norma facialis of the same.

Fig. 3.—Skulls of Dyak from Borneo (to left), and Hova from Madagascar in norma lateralis.

Fig. 4.—Norma facialis of the same.

The writer is indebted to Mr F. W. Green, of Jesus College, Cambridge, for the above photographs.

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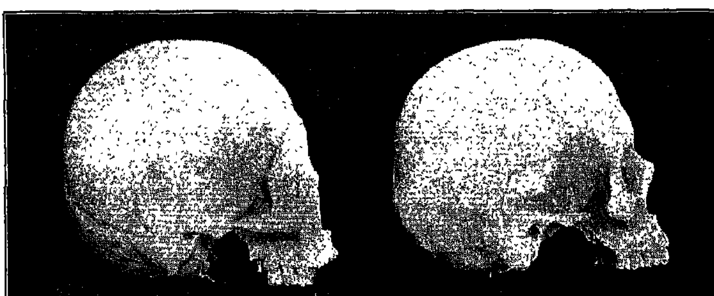
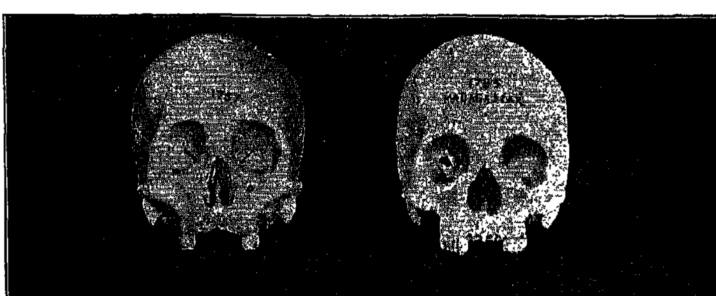




The third specimen is labelled "Skull of a Hova," and is in good preservation, though it has been perforated in the region of the obelion. The full dentition and the closure of the basilar suture indicate maturity, and the stout zygomatic arches, pronounced glabella, and large teeth indicate the male sex of this specimen. It is bleached as though it had lain in dry, dusty soil, and thus presents the first of a number of points of difference from the two preceding skulls. For this is a short, round skull, prognathic to a slight degree only when viewed in norma lateralis. In norma facialis, the width of the face appears greater than in the two preceding cases; the orbits are large and their axes droop slightly externally, the canine fossæ are deep, the nasal bones prominent, the apertura pyriformis wide and with sharp inferior margins.

In norma basilaris, the shortness of this skull is evidenced in the arrangement of the structures at its base. The palate is wide and deep, the remaining teeth but little worn. Some destruction, due to weathering, has occurred near the foramen magnum, which is of moderate (relative) size and roughly diamond-shaped.

The above notes on the craniological features of the specimens may now be supplemented by a few words on the table of measurements.

With regard to the first specimen, the Betsimisaraka, the cubic capacity is 1450 c.c.; the maximum length is considerable, viz., 186 mm.; the dolichocephalic character is clearly shown by the breadth index, which nearly approaches the vertical index. (71 = breadth index, 70 = vertical index.)

In the case of the Betsileo skull, the cubic capacity is somewhat greater than in the preceding example, being 1480 c.c., the lengths almost identical; the cephalic index again denotes marked dolichocephaly and equals the vertical index (72·4).

In the third case, the cubic capacity falls short of that of either of the preceding specimens, being only 1315 c.c. The breadth index denotes the marked brachycephalic character and somewhat exceeds the vertical index. A dental index could be calculated and the figure (43·15) places this skull in the mesodont group.

It is now possible to institute comparisons between these skulls and to attempt to trace resemblances between each in turn and specimens from other parts of the world. First, it is evident from a brief survey, that Madagascar can furnish at least two types of crania; for the two specimens first described correspond nearly in general features, and both differ from the third. Thus appearances indicate that the Betsimisaraka and Betsileo skulls are long and narrow, with narrow and flattened faces; to such general features may be added similarity in the shape and disposition of the tympanic ring at the external auditory

meatus (viz., downward prolongation); the comparatively deep glenoid fossa; the relatively large foramen magnum. Whereas the Hova skull is broad, the face wide, the nose prominent, there is but slight downward prolongation of the tympanic ring, and the glenoid fossa is shallow. Some of which is reiterated by the table of measurements, which leads to the recognition of similarity between the first two, particularly in the following points:—

Character	Betsimisaraka	Betsileo	Hova
Cubic capacity	1450	1480	1315
Horizontal circumference	511	515	483
Maximum length	186	185	168
Maximum breadth	132	134	138
Naso-malar index	108·5	109·7	113·5

while both contrast with the Hova in all respects save the breadth. Such facts point to what has already been expressed in earlier publications, viz.: that among the various races now inhabiting Madagascar some are distinctly dolichocephalic, others decidedly brachycephalic. And, moreover, that the former type is that of the wilder tribes whose affinities seem to rank them with the negro races, while the latter class is represented by the more civilised Hovas, who are regarded as of Malayan origin.

The evidence for such statements comes from several sources, for instance the physical appearance, the language, history, legends, customs, and arts, of the respective tribes, and this paper will be concluded by a brief review of the results of the study of the first of these, more particularly in respect of craniology.

The accounts already published of the Betsimisaraka and Betsileo tribes are not very numerous. A good bibliography up to the year 1885 is given by Professor Max Leclerc in a most interesting paper published in that year in the *Revue d'Ethnographie*. It is therein recognised that a great diversity of races is met with in Madagascar. There seems to be no certain evidence of the characters of the aboriginal inhabitants.

The earliest race of which any record is left (the Va-Zimba) has been thought to be allied to the Bantu family. It was succeeded by various tribes which agree in certain negroid characteristics and among which are the Betsimisaraka and Betsileo. But here the difficulty arises of ascertaining whether the features referred to as negroid approximate these tribes to the African or to the Oceanic negro.

MM. de Quatrefages and Hamy report (*Crania Ethnica*) that of the various tribes some (viz., the Sakalaves and Antchianakas) are nearly allied to the Bantu family, whereas others (such as the Antankares and Betsimisarakas) are more decidedly negro than the former. Leclerc (*op. cit.*) suggests a common origin for these and the Betsileo tribes, and regards this original race as African. Herein he is opposed to such writers as Grandidier, Oliver, Sibree, Ellis, who regard such an origin as "Oceanic"; while de Quatrefages in a later work[1] (1889) than the *Crania Ethnica* considers the races of Madagascar as allied to the Papuans rather than to the negroes of Africa. Writing in 1892, Professor Sibree described the Betsileo as a race darker in colour than the Hova, probably descended from Melanesian ancestors or from a mixture of dark and light Pacific Islanders, and supports the statement by evidence from the character of certain ornamental carvings[2]. Another view is that of Macé-Descartes (quoted by Leclerc, *loc. cit.*), who regards the Betsileo as allied to the Hova race.

MM. de Quatrefages and Hamy besides basing their opinion as to the Papuan affinity of these tribes on considerations of language, remark on certain of their cranial characteristics, notably hypsistenocephaly and frontal compression, which are known to distinguish Papuan skulls. But of the series of figures they publish, it appears that in the case of three male Betsimisaraka skulls only, do the proportions approach those of Melanesian skulls, for in these three the dimensions give to the average a marked degree of hypsistenocephaly and a moderately low nasal index. In contradiction to such an indication must be mentioned the high figure representing the orbital index. In the same table, measurements relating to two female Betsimisaraka skulls show that in these the vertical index is as much below the breadth index as it was above it in the case of the male skulls[3].

Finally, a skull from Madagascar in the Museum of the Royal College of Surgeons is distinctly platycephalic. So that from measurements on actual specimens but little evidence can be brought forward with regard to the Betsimisaraka, and even less with regard to the Betsileo skull.

This being so, the Betsimisaraka and Betsileo skulls in the Cambridge Museum were compared with other specimens in that collection with the following results. From appearances no distinct resemblance to the Melanesian skulls can be discovered, the chief

[1] *Histoire générale des Races Humaines.*

[2] Certain Betsileo designs of carving almost exactly reproduced in the Hervey islands. Sibree: *Journal of the Anthropological Institute*, 1892.

[3] A condition characteristic of female skulls of various races.

differences being in respect of size of facial skeleton, prognathism, and depth of canine fossæ. Neither can resemblances be traced to the Kaffir skulls, or to some negro skulls from the west coast of Africa. There are, however, two African skulls which bear a general resemblance in shape to the Betsimisaraka skull. One of these is that of a Mobangi native from Central Africa about a thousand miles from the mouth of the Congo, the other that of a Makua native from near Zanzibar. Besides the general aspect and contour, the Mobangi skull is not far removed in proportions from the Betsimisaraka. The Makua skull is much smaller than either and agrees only in minor details of measurement. Figures representing some of the chief dimensions of these skulls have been arranged in a comparative table, together with figures relating to the specimen from Madagascar, in the museum of the Royal College of Surgeons. (Flower's *Catalogue*, No. 1306.)

So that if one might argue from so few examples, the indications are to regard the affinities of these tribes (despite their language) as approximating them to certain African negro races, though it is possible that the latter themselves may have some connection, as yet unrevealed, with the Oceanic negroes (*v.* Max Leclerc, *loc. cit.*).

There remains to consider the Hova skull. Though the date of the arrival of the Hovas in Madagascar is uncertain, yet there seems to be some evidence for placing it in the 7th century A.D. Physical conformation, tradition, and language point to an origin which may be referred to as Indonesian.

MM. de Quatrefages and Hamy (*Crania Ethnica*) record the occurrence in a Hova skull of a cranial deformity previously met with in the Malay peninsula. These authors also state that the Hova skulls resemble certain skulls of the Antankares (one of the wild tribes of Madagascar who have mingled with the Hovas), and describe an Antankare coffin as very similar to those in use in the Philippine Islands, while the skull of the contained corpse was brachycephalic, and of an Indonesian type. The measurements recorded by these authors as the mean of two male specimens, are not closely approached by those of the Hova in the Cambridge collection, for the latter is of smaller capacity and more distinctly brachycephalic than the former. No strong resemblance can be traced to either the Polynesian specimens or to a skull from Manilla in the Cambridge museum. However a most striking similarity is found between the Hova skull and that of a Dyak from North Borneo in the same collection, and this similarity in form and proportion is confirmed by the principal measurements and indices, which have been tabulated side by side, and in almost every instance correspond closely, the only notable exception being the nasal

index. On searching for measurements of other Indo-Malayan skulls, two specimens in the museum of the Royal College of Surgeons seem to approach in proportions those just mentioned, and the figures relating to these have been added to the comparative table. Finally the measurements of a skull from the Philippine Islands (recorded in the same volume of Flower's *Catalogue*) present a number of features similar to both the Hova and Dyak skulls, and are of increased interest in consideration of the statements of MM. de Quatrefages and Hamy in regard to the Antankare and Hova tribes of Madagascar (*v. supra*).

In conclusion, a study of the specimens at Cambridge shows that the Hova skull finds its counterpart in one from Borneo, and differs widely from the Betsileo and Betsimisaraka skulls; that the two latter agree in such features as distinguish them from the Hova, and resemble certain skulls from the African continent rather than any Oceanic specimens[1].

TABLE I.

DIMENSIONS OF SKULLS FROM MADAGASCAR IN THE ANATOMICAL MUSEUM, CAMBRIDGE UNIVERSITY.

Catalogue No. of Skull	1783	1784	1785
Sex	—	Male	Male
Approximate Age	Adult	Aged	Adult
Cubic capacity	1450	1480	1315
Maximum length	186	185	168
Ophryo-iniac length	179	178	162
Ophryo-occipital length	183	183	165
Occipito-spinal length	179	192 (?)	170
Occipito-alveolar length	187	200 (?)	178
Maximum breadth	132	134	138
Bi-asterial breadth	106	110	109
Bi-stephanic breadth	109	109	120
Bi-auricular breadth	111	115	117
Minimum frontal breadth	94	98	92
External bi-orbital breadth	98	108	105
Minimum inter-orbital breadth	27	27	29
Bi-zygomatic breadth	115 (?)	130 (?)	130

[1] Since the foregoing account was written, I have read the important paper on Skulls from Madagascar by Prof. Virchow ("Verhandlungen der Berliner Gesellschaft für Anthropologie": Sitzung vom 18 Juli, 1896). Without attempting to discuss this paper, I will mention that the measurements there given of two Hova skulls approach most nearly those of the Betsileo skull described in the present paper.

TABLE I.—*continued.*

Catalogue No. of Skull	1783	1784	1785
Sex	—	Male	Male
Approximate Age	Adult	Aged	Adult
Bi-malar breadth	108 (?)	115	113
Bi-maxillary breadth	90 (?)	100	92
Jugo-nasal breadth	94	103	96
Ophryo-alveolar length	92	92	87
Nasi-alveolar length	70	68	65
Basi-alveolar length	95	101 (?)	92
Basi-nasal length	95	101	95
Basi-glabellar length	105 (?)	109	102
Basi-bregmatic length	130	134	132
Basion to obelion, length	128	132	122
Basion to lambda, length	115	119	110
Basi-iniac length	80	85	75
Basion to opisthion, length	39	38	34
Breadth of foramen magnum	32	31	31
Orbital height	30	33	33
Orbital breadth	35	40	37
Nasal height	49	50	45
Nasal breadth	28	31	28
Palato-maxillary length	49 (?)	53	52
Palato-maxillary breadth	58 (?)	65	65
Anterior palatine breadth	28	28	27
Posterior palatine breadth	37 (?)	42	41
Arcs: Frontal	131	133	129
Parietal	128	128	114
Occipital; *to Inion*	69	66	60
Occipital; *Inion to Opisthion* ...	50	50	46
Supra-auricular	303	310	309
Oblique parietal	351	363	359
Jugo-nasal arc	102	113	109
Horizontal circumference	511	515	483
Height of choanæ	35 (?)	?	30
Breadth of choanæ	32 (?)	33	30 (?)
Length of floor of nasal cavity	38 (?)	?	36
Least distance between temporal crests	94 (?)	104 (?)	124 (?)
Weight of skull (without jaw)	445	533	418
Combined length of three molar teeth ...	—	—	28 L.
Combined length, molars and pre-molars	—	—	41 L.
Indices: Cephalic	71	72·4	82·1
Vertical	70	72·4	78·6
Alveolar	100	100 (?)	97
Orbital	85·7	80·25	89·2
Nasal	57·14	62	60
Palato-maxillary	?	122·6	125
Facial superior (Broca)	80 (?)	70·8 (?)	66·9
Facial superior (Kollmann)	60·9 (?)	52·3 (?)	50
Stephano-zygomatic	94·8 (?)	83·1 (?)	92·3
Naso-malar	108·5	109·7	113·5
Dental (Flower)	—	—	43·15

TABLE II. COMPARISON OF SKULLS FROM MADAGASCAR WITH OTHER SPECIMENS.

Skull	1784	1783	1749	1306	1727	1785	1787	732A	744	747
Measurement or Character	*Betsileo*	*Betsimsarak*	*Mobangi*	*Majambo*	*Makua*	*Hova*	*Dyak*	*Java*	*Borneo*	*Philippine*
Age and Sex	Adult ♂	Adult ♀	Adult?		Adult	Adult ♂	Adult ♂	Adult ♂	Adult ♂	Adult ♂
Cubic capacity	1480	1450	1360	1460	—	1315	1378	1370	1410	1240
Maximum length	185	186	177	186	169	168	165	172	173	165
Maximum breadth	134	132	133	141	126	138	138	139	142	140
Vertical (B.-Br) height ...	134	130	133	127	114	132	133	135	?	127
Basi-alveolar length	101	95	99	102	91	92	90	102	97	92
Basi-nasal length	101	95	98	95	86	95	97	100	98	99
Horizontal circumference ...	515	511	504	524	480	483	485	498	498	483
Cephalic index	72·4	71	75·1	75·8	74·6	82·1	83·6	80·8	82·1	84·8
Vertical index	72·4	70	75·1	68·3	—	78·6	80·6	78·5	—	77
Alveolar index	100(?)	100	101	107·4	105·8	97	92·8	102	99	92·9
Orbital index	80·25	85·7	100	82·5	89·2	89·2	89·2	90	87·2	88·9
Nasal index	62	57	58	55·1	66·5	60	49	54	47	48·9
Naso-malar index	109·7	108·5	111·4	—	109·7	113·5	108·6	—	—	—
Facial index, Kollmann ...	52·3(?)	60·9(?)	57·25	—	49·5	50	50·4	—	—	—

The dimensions of the Hova skull nearly approach those of a female Hova skull measured by MM. Quatrefages and Hamy, and its appearance in general resembles that of a Hova skull (Collection Daullé) figured in their work (*Crania Ethnica*).

Reference to specimens in the Museum of the Royal College of Surgeons:—

No. 1306. A skull from the N.W. coast of Madagascar.
No. 732A. A skull from Java.
No. 744. A skull from Borneo.
No. 747. A skull from the Philippine Islands.

NOTE ON THE SKULL OF AN ANDAMAN ISLANDER.

THE Cambridge Ethnological Museum contains the skull of an Andaman Islander which forms part of a collection of objects from the Andaman Islands presented by Colonel Temple.

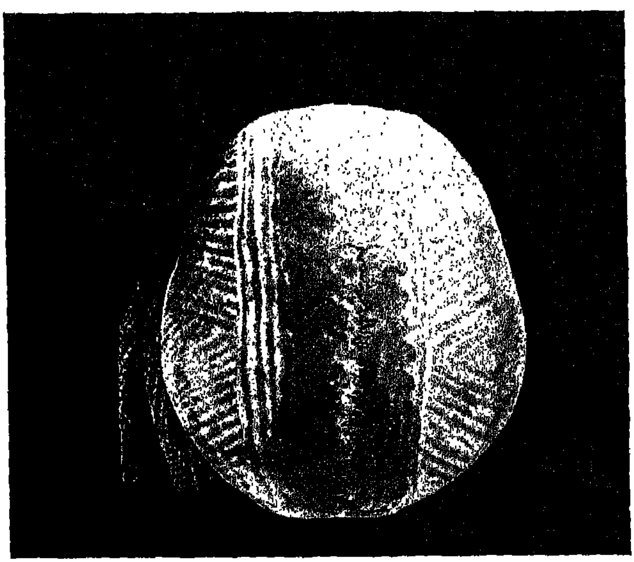


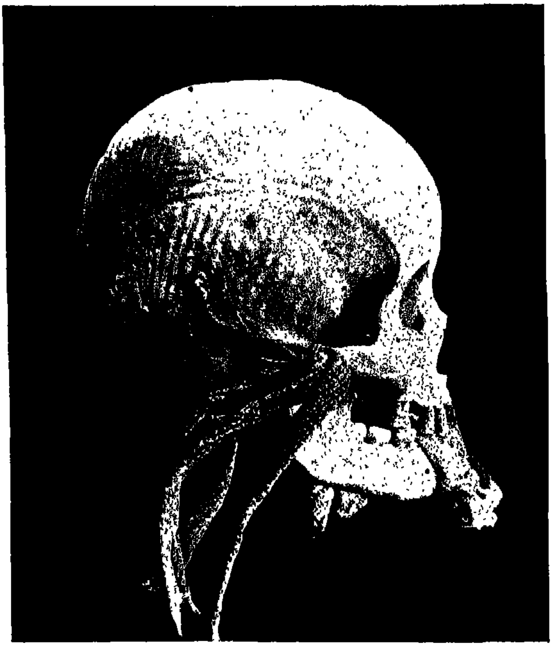
Fig. 1. Norma verticalis.

The specimen (which bears the following distinctive marks and description, "No. 45, 'Changa-lōt-chēta,' as carried by relatives of the deceased, in memoriam") is in fairly good preservation: the mandible is present, and this and the cranium have been smeared with red and

white paint. A sling of plaited vegetable fibre is attached between the zygmotic arches and would enable the skull to be easily suspended or carried about as suggested in the foregoing description. It is not proposed to enter into a discussion of the ethnological significance of such a method of preparation of the skull, but the photographs (cf. figs. 2, 3, 4), shew the general characters of the decoration and of the sling.

The skull is that of an adult individual, the sex not being evident, but probably male. The general aspect is cuboid, the skull being distinctly short. Fig. 1 shows the skull in *norma verticalis*; it is brachycephalic and crypto-zygous: no synostosis of sutures is observed: there is a single parietal foramen on the left side.

Fig. 2 shows the skull in *norma lateralis*: the prognathism is subnasal, and distinct, though not revealed by the alveolar index: the



Norma lateralis.

glabella is flattened, as are also the nasal bones; the lacrymo-ethmoidal suture is of good length (right side, 8·5 mm.; left side, 9·5 mm.): the spheno-parietal suture measures 12 mm. on each side and contains

a small ossicle. The maxilla and sphenoid meet to the exclusion of the malar bone from the boundaries of the spheno-maxillary fissure in each orbit. Infantile characteristics are denoted by the feebleness of the temporal and other muscular ridges, the small size of the mastoids, and the shallowness of the external auditory meatus. The frontal bone rises abruptly above the nasion, the bregma is the highest point of the sagittal arc, there is slight flattening at the obelion, and no protuberance or torus on the occipital bone; the skull rests (on a plane surface) upon the molar teeth and the opisthion.

Fig. 3 is a view of the skull in *norma facialis*; the skull wall is markedly protuberant in the pterion region, suggesting high development

Fig. 3. Norma facialis.

of the frontal lobes of the brain, and the transverse cranial arc is well rounded even posteriorly to the bregma. The nasal bones are flat, but the nasal aperture is not strikingly wide. The canine fossæ are not deep, and both malar bones undivided. On the left side there is destruction of the alveolar margin of the jaw, which is apparently the result of disease of the teeth and of alveolar abscesses.

Fig, 4 shows the skull in *norma basilaris*: a large molar tooth showing much wear remains on each side of the palate, which is small and has a blunt posterior spine. The two pterygoid plates on each side are also small and no (pterygo-spinous) foramen of Civinini is seen. The glenoid fossa is of moderate depth; the carotid canal is completely covered in, and small eustachian processes are present on each side. The styloid processes and occipital condyles are small and the foramen magnum is not pyriform. Postcondylar foramina are present on each side. In *norma occipitalis* the contour is pentagonal; several wormian bones are present on each side of the lambda.

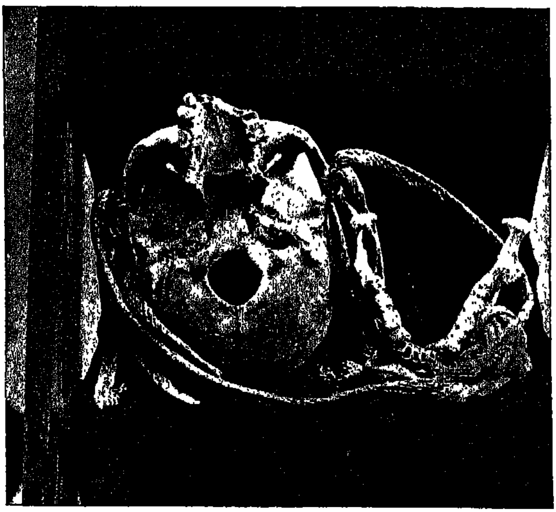


Fig. 4. Norma basilaris: jaw alongside.

The mandible is small and the teeth relatively large; the mandibular notch (sigmoid) is of moderate depth, and the angle of the ramus and body of the mandible exceeds 90°. The following notes refer to the teeth. The first and second molars on each side are of the normal human form and tetracuspid. The third molars are of smaller size than the preceding and have three large cusps, viz.: antero-external, antero-internal, and postero-external; while the postero-internal cusp is very small and a small accessory cusp is seen between the antero-external and postero-external cusps and on the outer border of the crown. The dimensions of the crowns of the lower molar teeth are as follows (in every instance the antero-postero diameter is given first, followed by the transverse diameter):

Right side

First molar, 12 × 11.5 mm	Third molar, 11 × 10.5 mm.
Second molar, 11 × 11 mm	

Left side

First molar, 11.5 × 11.5 mm	Third molar, 11 × 11 mm
Second molar, 11 × 11 mm	

The principal dimensions of the skull itself are as follows —

Maximum length, 159 mm	Basi-bregmatic height, 134 mm
Maximum breadth, 129 mm	Horizontal circumference, 470 mm

The chief indices are as follows —

Cephalic index, 81.1	Kollmann's facial index, 44.7
Height index, 84.3	Orbital index, 82.9
Alveolar index, 102.2	Nasal index, 48.8

In reviewing the several features which have been mentioned, there will be noticed a distinct lack of osteological characteristics denoting morphological inferiority; there are, however, certain infantile features which have been retained to maturity. Such retention of infantile features is common among individuals of the races of small stature, among whom the Andamanese are to be placed. No argument as to the inferiority of the Andamanese skull can therefore be based on this observation.

As regards comparisons with other Andamanese crania, the present example is quite representative; its dimensions fall within the limits of those recorded by the late Sir William Flower in his classical account of the osteology of the aborigines of the Andaman group of islands (*Journ. Anthr. Inst.* ix.).

SOME ANTHROPOLOGICAL RESULTS OF THE SKEAT EXPEDITION TO THE MALAY PENINSULA.

(*a*) Description of a Skeleton of a Pangan Semang[1].
(*b*) Notes on the Measurements made by F. Laidlaw, Esq., B.A., Trin. Coll.

1. The Natives Measured.
2. The Measurements and Results therefrom.
3. Notes on Two Specimens of Hair.
4. Notes on Two Outline Tracings of the Feet.

(*a*) THE SKELETON OF A PANGAN SEMANG.

1. Description of the Skull.
2. Description of the Bones of the Skeleton.
3. Critical Notes on the Skull.
4. Critical Notes on the Bones of the Skeleton.
5. List of Measurements.

1. THE skull (figs. 1 and 2), which is in excellent preservation, appears to be that of a male, and is certainly that of an adult. When viewed in norma verticalis it is ellipsoid, mesaticephalic and just phænozygous; it is somewhat asymmetrical, the left side being rather flatter than the right. Synostosis has occurred in the sagittal suture at the obelion, and in the coronal suture on each side at and below the stephania. Several depressions or pits with almost circular margins are seen on the frontal bone; they are probably local evidences of a general pathological condition found to obtain in almost every part of the skeleton. The glabellar prominence is very moderate in amount, the frontal curve bold, the antero-posterior arc of the cranial vault regular with the exception of a slight interruption at the bregma. No prominence marks the position of the inion. At the pterion, the sphenoid and parietal bones join on each side of the skull. Muscular ridges are feebly developed, and the zygomatic arch is slender. The nasal profile is comparatively flat, but

[1] The Pangans are a tribe of the aborigines known as Semangs, whose affinities would seem to be with the aborigines of the Andaman Islands. The Sakai are another aboriginal group found in the Malay Peninsula, and though now not always distinguishable from the Semang, must be regarded as having been originally distinct from these. Moreover their affinities are not with the aboriginal Andamanese so much as with the Veddah aborigines of Ceylon.

the nasal spine is large; prognathism of the sub-nasal or alveolar, and of the dental varieties, is marked; the teeth in the upper arcade project well beyond those of the lower jaw in the incisor region. The transverse cranial arc is well rounded and is not scaphoid even posteriorly to the bregma; the orbits are mesosemic with bevelled margins; the lacrymal hamulus is diminutive, the lacrymo-ethmoidal suture of considerable length on each side; the malar bone is excluded from entering into the boundaries of the spheno-maxillary fissure by the junction,

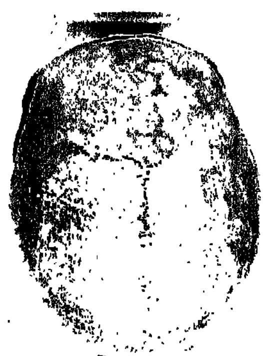


Fig. 1. Skull of Pangan Semang: norma verticalis.

posteriorly to it, of the sphenoid and maxilla. The nasal bones are large and rather flat; the apertura pyriformis nasi is cordate in outline, and its lower margins are extremely indistinct (orygmo-craspedote). The canine fossæ are moderate in depth; a wide gap separates the alveoli of the two median upper incisor teeth; a blunt spine projects from the malar process of each superior maxilla. The palate is hypsiloid in contour, the teeth large and blackened, and the anterior surfaces of the incisors and canines have been filed. The tuber maxillare is of large size, the posterior palatine spine blunt and notched. The glenoid fossæ are deep, the paracondylar processes small. No special note is necessary on the conformation of the margins of the foramen magnum. In norma occipitalis the contour is almost circular, and the lambdoid suture presents denticulations of moderate complexity. The chief features of the mandible are the slightness of prominence of the

chin, the shortness of the ascending ramus, and the shallowness of the sigmoid notch. Reference to the list of indices shows that this skull should be described as mesaticephalic, metriocephalic, mesognathous, chamæprosopic, microsemic, platyrrhine, mesoprosopic, and mesocephalic.

2. The whole of the vertebral column, with the exception of the coccyx, has been preserved. On the cervical region no special notes have to be made, no additional foramina are seen in the atlas, and the lower vertebral spines (except the seventh) are bifid. No marks of

Fig. 2. Skull of Pangan Semang: norma lateralis.

inferiority are observed here or in the thoracic region; the lumbar region appears very straight when the several vertebræ are placed in apposition, but the intervertebral discs when *in situ* may have given a very different aspect to this region. It is noteworthy that the signs of the periosteal inflammation so widespread in this skeleton are hardly observable here (*i.e.* in the vertebral column). There is no special remark to make about the sacrum. The scapulæ are small, with deeply excavated subscapular fossæ; they are relatively very broad, and the inferior angle is curiously truncated in each; the roughness of the surface of the bone due to periostitis is well marked here, the bone near the vertebral border having actually been perforated in the right scapula. The same roughness is very marked on the somewhat large acromion processes, especially at the attachment of the middle part of the deltoid. The coracoid is large in each scapula and the upper border very straight. The clavicles show evident signs of disease. It is doubtful, however,

whether this very peculiar form is altogether pathological; the peculiarity consists in the exaggeration of the normal curve (with concavity directed forwards) of the outer part of the bone. The two portions of the bone meet at about a quarter of its length from the outer end, at an angle which in the right clavicle is nearly 90 degrees.

The sternum is flat, and the gladiolus and manubrium still separate; only six facets for rib-cartilages can be distinguished on each side.

The ossa innominata give useful evidence as to the sex of the individual, for the smallness of the subpubic angle indicates clearly the male sex. The ilia are, however, somewhat splayed, and their crests not so much incurved anteriorly as in European pelves. The ilio-pectineal lines are prominent ridges.

There are twelve ribs from each side, showing in many cases irregularities of surface due to pathological causes; there is accordingly some difficulty in identifying the side to which certain of them belong, the upper margins in particular being very sharp.

The bones of the hand and foot are incomplete in number, and the chief remark to be made is that the ravages of disease are very marked in the bones of the feet, and especially so in the os calcis of each foot and in the metatarsals, the fifth being particularly deformed.

The long bones of the limbs are present, with the exception of the right radius and ulna. The humeri and tibiæ bear many traces of periostitis, the fibulæ, the radius, and ulna of the left side to a less extent than the bones first mentioned, the least affected of all being the femora. The latter are, in fact, the only bones which afford reliable information. They are rather straight in the shaft; no pilastering is seen, though the lineæ asperæ are fully developed; there are distinct accessory adductor tubercles; and partly owing to a flattening of the anterior aspect of the shaft opposite the popliteal space, partly to its own development, the anterior limit of the articular surface of the lower end terminates on a very marked prominence. Platymeria (transverse) is distinct, and no bulging of the shaft is seen posteriorly in the popliteal space.

3. Speaking generally, the characters of the skull are not such as will cause it to be referred at once and unhesitatingly to any well recognized type. It would not have been surprising to find that such a skull was brachycephalic and microcephalic, like the crania of Andamanese and other Negrito races. But the specimen under consideration is mesaticephalic (78·7) and mesocephalic (capacity 1,425 c.c.).

We note, however, certain characters of inferiority. In the first place may be mentioned two features (often seen in lower races) which are to be regarded not as racial peculiarities, but as constituting reten-

tions of conditions normal in infancy; these are rotundity of contour in norma occipitalis, and shortness of the ascending ramus of the mandible. The condition of the teeth and of the cranial sutures leaves no doubt as to the skull having reached full maturity.

In the next place, the conformation of the skeleton of the nose, and the prognathism, which is of the variety known as subnasal, and is moreover both alveolar and dental, constitute resemblances to skulls met with frequently among the negro races; moreover, the resemblances are to African and especially certain Central African crania rather than to those of Oceanic negroes. The lack of distinctness in the characters which usually determine sex is also in favour of this view.

No definite resemblance could be traced, however, to the crania of Bush natives of South Africa (and this is all the more noteworthy because in certain characters the other bones of the skeleton resemble those of the Bush race in the Cambridge Museum), nor to the crania of the natives of the Punjab, nor to a skull from Manilla, nor lastly to that of a Veddah. But it is important to notice that the facial features are similar to those of certain crania from Sumatra, Java, and Borneo (cf. Nos. 882, 927, 966, 967, in the Museum of the Royal College of Surgeons) and to one Andamanese cranium in the same collection. From the morphological standpoint we may say, then, that the cranium presents several features common to the lower races, any of which may, however, occur in skulls of the highest races; and further that the concurrence of such characters in the same cranium confers upon it marks of inferiority not revealed by a superficial examination.

4. *Comments on the Skeleton.*—It is necessary again to refer to the pathological changes that have taken place in the skeleton. It is noteworthy that the articular surfaces of the bones are, comparatively speaking, but little affected, the non-articular surfaces suffering most. Thus this is not a case of osteo-arthritis, but there are not lacking conditions resembling those described by Virchow (*Zeitschrift für Ethnologie*, 1895, p. 709) in the humerus of a bear, under the name of Hohlengicht. [It is a matter for discussion whether the disease was that called by Virchow (*loc. cit.*) elephantiasis.]

The skeleton seems to have been originally slight and slender, and the individual was of small stature, probably about 1,497 mm., which, as will be seen later, is a stature very near the average of Pangan men.

In comparison with the dwarf skeletons of Bush natives, several points of comparison present themselves. Firstly, the size and proportions of the scapulæ are not unlike in the two cases, though the acromion and coracoid processes are much more massive in the Semang skeleton. It may not be out of place to mention that the Bush and

Semang scapulæ differ alike from those of the orang-utan and chimpanzee, somewhat less from that of the gorilla.

The second point of similarity is the slenderness at the lower ends of the femora in the Bush and Semang skeletons alike.

In the third place, an accessory adductor tubercle appears on the femora of both skeletons.

Lastly, the size and general shape of the ossa innominata and the comparative lack of curvature of the iliac crests constitute further resemblances. On the other hand, differences obtain in the sacra, and on the whole the Semang bones are larger. The great length of fore-arm said to characterize the Andamanese is not present in the Semang.

To sum up, then, we find here again certain signs of similarity with the skeleton of one of the lower races and departures from the higher types; the platycnemia has not been discussed, as the evidence derived from such pathological specimens scarcely justifies it.

From such a general comparison, we must turn to the special comparison of this skeleton with those described by Professor Sir William Turner in the *Transactions of the Royal Society of Edinburgh* (vol. xl, Part 1, No. 6) as representative of Sakais[1]. But from the figures and description of the first of these examples, consisting of the skull with parts of the skeleton, it can only be concluded that the resemblances with the Semang skeleton which forms the subject of the present contribution are quite insignificant. The following figures for various characters will demonstrate clearly these differences.

Character		Turner's Specimen from Kampar	Cambridge Specimen
Skull:	Capacity	1155	1425
	Breadth index	74·6	78·7
	Height index...	76·5	72
	Nasal index	58·5	55·3
	Orbital index...	78	82·3
Skeleton:	Sacral index	102	108·6
	Pelvic (brim) index	108·5	?
	Radio-humeral index ...	80·2	78·3
	Tibio-femoral index	80·9	87·7
	Platymeric index	78	74·7
	[2] Intermembral index	68·3	68·2
	Femoro-humeral index ...	68·7	72·3 71·8
	Estimated stature	1365	1497

[1] For the meaning of this term, cf. footnote on p. 242.

[2] Closest approximation.

The comparison need not be pushed further, and this part of the subject must be concluded with the remark that even among aboriginals of the Malay Peninsula, who agree in the possession of small stature, the variations in skeletal and cranial morphology are very considerable.

The second example described by Turner is a skull possessing a certain number of points of resemblance with the Cambridge specimen, and these are exhibited in the following table:—

Character	Turner's Specimen from Pahang	Cambridge Specimen
Cranial capacity	1385	1425
Breadth index	79·4	78·7
Height index	76·6	72
Nasal index	51	55·3

Finally, when comparisons are instituted between the Cambridge specimen and the "Pangghan" skull described by Virchow (quoted by Turner, *op. cit.* p. 119), the following results are obtained, as shown in the table:—

Character	Virchow's "Pangghan"	Cambridge Pangan
Capacity	1370	1425
Breadth index	81·5	78·7
Height index	76·9	72
Orbital index	80	82·3
Nasal index	50	55·3

The similarity is no greater than in the preceding case. On the whole, the conclusion that will be arrived at is, in my opinion, that intermediate forms of skull connect the distinctly dolichocephalic and brachycephalic types described by Turner, and that it is impossible to say whether the intermediate or either of the extreme types is the original one[1]. It would be out of place to enter into a discussion of the cranial characters of the Malays, but examination of the Malay crania in the Museum of the Royal College of Surgeons in London shows that here also a great diversity of cranial form obtains.

[1] It is by no means unlikely that the original Semangs were brachycephalic, the Sakai being dolichocephalic.

5. List of Measurements of Skull and Other Parts of the Semang Skeleton.

Measurements of Skull.

Description: Pangan Semang from Malay Peninsula, collected by W. Skeat, M.A.		Bi-zygomatic breadth ...	134
		Orbital height	33
		Orbital width	40
		Nasal height	47
Cranial portion:		Nasal width	26
Maximum length	179	Jugo-nasal arc...	107
Maximum breadth	141	Jugo-nasal width	97
Basi-bregmatic height... ...	129		
Horizontal circumference ...	511		
Cranial capacity. Each observation (2) gave 1425 c.c. = mesocephalic		Indices:	
		Cephalic	78·7
		Altitudinal	72
		Alveolar	102
Facial portion:		Facial (Kollmann's)	46·2
Basi-nasal length	99	Orbital	82·3
Basi-alveolar length	101	Nasal	55·3
Nasi-alveolar length	62	Naso-malar	110·3

Measurements of Bones of the Skeleton.

				Anterior height of Centrum	Posterior height of Centrum
Bone, etc.:	R.	L.	Lumbar vertebræ:		
Humerus ...	308	305	First	23	25
Radius	?	239	Second	23	25
Femur	426	425	Third	24	25
Tibia	374	372	Fourth	25	23
Ulna	?	253	Fifth	27	21
Fibula	365	361	Index given by combined figures... ..	97·5	
Radio-humeral index	?	78·3	Femur, *special measurements for:—*		
Tibio-femoral index	87·7	87·5			
Intermembral index	?	68·2	*Platymeria:*	R.	L.
			Transv. diam. ...	27	27
Femoro-humeral index	72·3	71·8	Antero-posterior diam.	20	20
			Platymeric index ...	74·7	74·7
	(Length)	(Breadth)	*Platycnemia:*		
Sacrum	93	101	Transv. diam. ...	21	19
Scapula—height	117	125	Antero-posterior diam.	33	29
" breadth	102	103	Platycnemic index ...	63·6	65·5
Sacral index ...	108·6		*Popliteal region:*		
Scapular index...	87·1	82·4	Transv. diam. ...	33	34
Clavicle	119	129	"M.N."	26	25
Claviculo-humeral			"M.P."	23	23
index	38·6	42·3	Popliteal index ...	69·6	67·6

6. *Note on the Photographs.*—The skull is represented as viewed in norma verticalis (Fig. 1), and in norma lateralis (Fig. 2), orientated in each case according to the "Frankfort" horizontal line.

The appearances will be found described in Section 1.

(*b*) Measurements on the Living.

The natives measured, cf. Table A, were eleven in number, and of these five were adult males, three adult females, and three immature, viz., a boy of fourteen, a girl of fifteen to seventeen, and a female child of three to four years. With regard to the elder girl, a review of the measurements led me to disregard them in the computation of the averages for adult females, although this individual in other respects might be looked upon as practically mature. Mr Laidlaw's notes on each individual are appended.

Mr Laidlaw's descriptive notes on the individuals measured.

1. Residence, Sungei Bumit in Aring. Formerly top teeth were filed down with sandstone in Malay fashion. Skin much scarred. Lips thick, slight straggly beard. Feet curved inwards and much splayed, little toe of left foot missing. Non-Mohammedan, stated his age to be forty-five years. Formerly married, no children.

2. Residence, Sungei Bumit. Slightly deaf. Lips thick. Feet contours normal. Head shaved with a razor given him by Penghulu of Kampong Buntal. Unmarried, Pandak's brother-in-law. Very restless.

3. Slave living near Kampong Buntal. Parents lived in jungle of Ulu Lebit. Middle finger of right hand deformed. Age stated by himself to be seventy years. Married, with two children. Colour 3 Topinard's scale. Eyes dark, rich brown. Hair short, woolly, very dark dull brown. Rampong Buntal.

4. Brother of No. 3. Slave, captured when very young. Religion, Mohammedan. Colour 3 Topinard's scale. Colour vision normal or nearly so, tendency not to distinguish between dark shades, dark purples being compared with dark reds, but rejected. The boy is very nervous and taciturn. Residence, Kwala Aring.

5. Residence, Sungei Sam. Son of No. 7. Skin a little lighter than Topinard's No. 3. Hair wiry, very closely curled. Teeth not filed, much worn, but white and undecayed. Non-Mohammedan. A slave; parents Pangans of Sungei Lebih. Has a moustache.

6. Petai or Petema. Residence, Sungei Sam. Skin a shade lighter than No. 5, covered with skin disease of a mild type. Eyes dark brown, strongly marked superorbital ridges. Eyes very restless. Has a moustache and beard of woolly hair. Six front teeth of upper jaw filed, slightly decayed. Has a humorous expression about the mouth. Parents from Sungei Gala.

7. Slave at Sungei Sam. Skin darker than No. 3 Topinard. Feet much splayed, as in No. 1. Eyes dark brown. Skin diseased.

8. Slave at Sungei Sam.

9. Slave girl at Kampong Buntal. Unmarried, but sexually mature. Feet and hands small and delicately shaped. Hair short, thick, and woolly. Parents lived in Ulu Aring. Inclined to steatopygia.

10. Wife of No. 3. Skin rather redder than No. 3 Topinard. Hair black and lanky like a Malay's. Eyes very dark brown. Parents and grandparents Pahang Sakais living on Sungei Sahan, tribe now moved down stream, no Malay admixture admitted. Mother of No. 11. Breasts very pendulous.

11. Daughter of No. 3 and No. 10. Skin colour No. 3 Topinard, but rather redder. Eyes dark brown, darker than in parents. Teeth, milk teeth, perfectly regular, the upper pair of incisors very large, two next smaller, much as in English children.

From the measurements provided, I have calculated the averages for each sex, and have embodied the results in a diagram which will show the general outcome of this method of dealing with the data (fig. 3). The consideration of this I propose to defer temporarily while dealing with the other observations of Mr Laidlaw. In the first place, the colour of the skin seems in general to be dark brown or chocolate, but there are two cases in which it was lighter than in the rest, and this point is of importance as confirming the statement made by recent observers (Martin) that the aborigines of the Peninsula may be divided, on considerations bearing on skin-colour, into at least two well marked classes, the one with a lighter skin than the other. As regards the colour of the eyes, a corresponding difference is not recorded, and in all instances the colour is a dark brown, probably of the shade so common among primitive races.

On coming to work through the notes on hair, it is found, however, that whereas in the majority it is woolly or closely curled, there is one instance of an adult, the woman Kebang, in whom the hair though black is not curled, but straight; this difference again confirms the remarks of earlier observers, and in the lantern slide showing a group of Semang examples of each kind of hair may be seen.

Finally, it is very interesting to notice that among the specimens

of hair shown is that of the child Kepar, of whose parents one (the father) is of the curly-haired type, the mother being the one example of all those observed presenting straight hair; the specimen of the child's hair shows that she resembles her mother in this respect.

With the mention that only one bearded man was observed, I may pass from the consideration of the hair to that of the teeth, which in many instances were seen to be filed; in one instance caries was noticed. In the skull sent to Cambridge the teeth are encrusted, as is so often the case with the teeth of crania of East Indian natives in general, with a dark deposit, probably betel nut. The front teeth in specimen have been filed (cf. account of the skull).

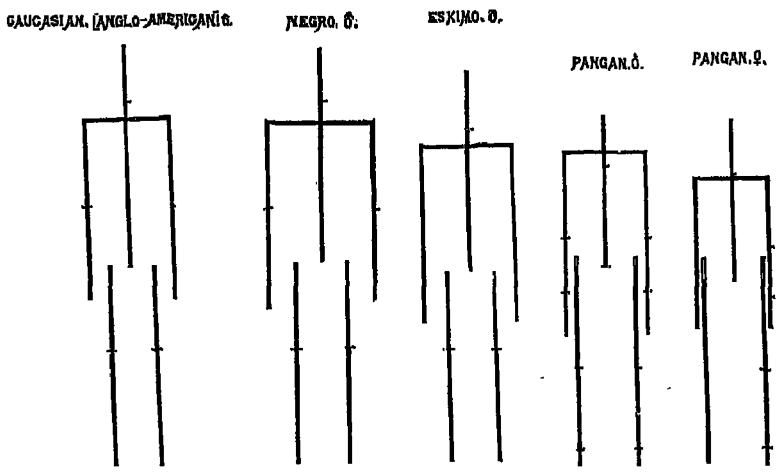


Fig. 3. Diagrams showing relative proportions of average Caucasian, Negro, Eskimo, Pangan Semang (male), and Pangan Semang (female).

Returning now to the measurements, it may be first noticed that the index of the head (cephalic index) gives for the men an average of 78·9, which agrees fairly well with the figures obtained for the skull previously described. The women would seem to have heads of a more spherical form, for the corresponding average index for these is 81·1; a greater number of examples (only three are available) would probably modify this figure somewhat.

Next the nasal index may be considered, and this yields the remarkable figure of 101·2 as the average for five adult males, and 97·4 as that for three adult females. A very great nasal width is indicated hereby, and to one familiar with the measurements in question

the figure alone gives a fairly good idea of the conformation of this particular feature.

The majority of the remaining measurements are, as has been already said, embodied in diagrammatic forms in the drawings to which attention may now be directed.

In the first diagram (fig. 3) is seen the figures of the adult Pangan individuals of the two sexes compared with one another. It is necessary, moreover, to notice, though it is not indicated on the diagram, that the average man with a stature of 1,491 mm. (about 4 feet 9 inches) exceeds the woman by about 83 mm. or 3½ inches.

Secondly, the position of the presternal notch with reference to the bi-acromial line should be remarked.

Lastly, the Semang diagram may be compared with those of other races. I have represented for comparison diagrams (for two of which I must express my indebtedness to Professor Thomson of Oxford) of adult males.

1.	Anglo-American...	stature	1,705.
2.	Negro	"	1,680.
3.	Eskimo (Labrador)	"	1,577.

[*Cf. Journ. Anthrop. Inst.*, vol. xxx, 1901.]

Which combine with the Semang to form a curiously regular series (diminuendo).

The following notes refer to the specimens of hair:—

No. 2 (♂).—Close coils; hair of a frizzled type characteristically negrito. Diameter of coils = 15 mm.

"Kutun" (♀).—Frizzly hair, which is long and thus to some extent unlike the preceding.

"Pandak" (♂).—Close coils; same type as "No. 2." Diameter of coils 15 mm. (less in parts).

"Bihiyah" (♀).—? Malay female; long, straight hair tied in coil; quite different from the three preceding examples.

* "Pa-Gelugor" (♂ aged).—Hair frizzly and rather long (about 70 mm.), and thus differing somewhat from No. 2.

* "Apiat" (? sex).—The hair has much the same characters as that of "Pa-Gelugor," but is slightly shorter.

* "Kachoug" (? ♀).—The hair is frizzly and closely resembles that of "Kutun."

[* The last three examples are from Jarum in Raman.]

Notes on the outline tracings of the feet.

—	Maximum length	Maximum breadth
"Pandak" R.	246	103·5
L.	246	97
"Yak Bertik" R.	228	96
L.	230	90
"Ragong" R.	231	99
L.	229	101

The tracings of feet comprise the following :—

"Pandak."—Right foot: broad; hallux turned inwards slightly.
Left foot: like right foot, but the small toe seemingly absent (cf. note on No. 1, p. 250). (Fig. 4. 1, 2.)

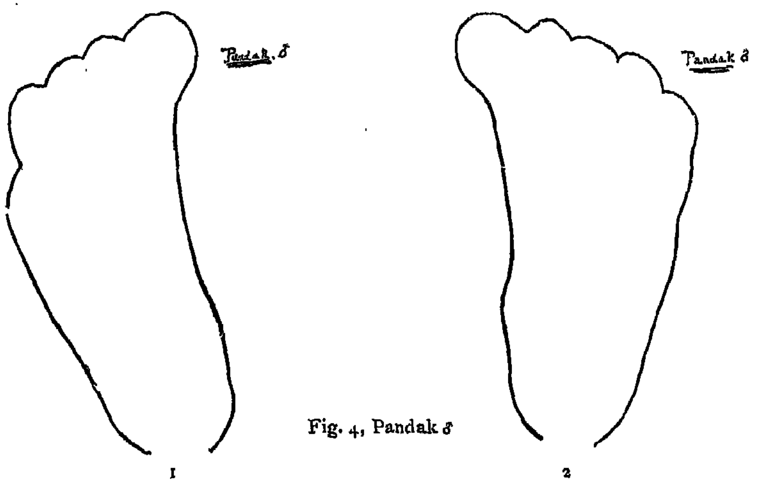


Fig. 4, Pandak ♂

"Yak Bertik."—Smaller foot; hallux as in Pandak's foot; the outer border of the foot is straight. No special differences between right and left feet, except that in the left foot the toes do not seem to have been properly pressed against the ground. (Fig. 4. 3, 4.)

The appearance of the tracings of the left feet of Pandak and of Yak Bertik give some confirmation of the statement made by Mikluko-Maclay to the effect that in the feet of the Semang tribes the outer toes are curved inwards and beneath the inner toes (cf. *Zeitschrift für Ethnologie*, viii, p. 228).

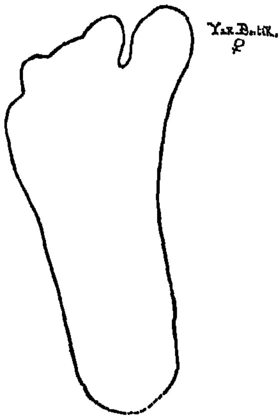
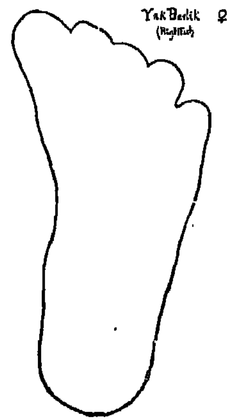


Fig. 4, Yak Bertik ♀



3

4

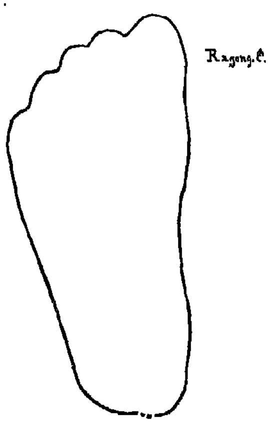
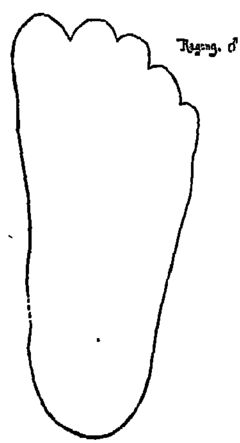


Fig. 4, Ragong ♂



5

6

"Ragong."—No special points of difference in right and left feet; the toes are all clearly marked; the hallux is not inverted so distinctly as in the two preceding cases. (Fig. 4. 5, 6.)

In none of these examples is the second toe longer than the hallux. The measurements are given on the preceding page.

NOTE ON A SKULL LABELLED "SŒMANG-SCHÄDEL ♂," "BUKIT-SAPI," UPPER PERAK, 1902; NOW IN THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.

THE former owner of the skull was a member of the tribe of Penghulu Dakabo (?), of Goyal (*i.e.*, "Mount") Sapi, about eight miles (*wegestunden*) from Kuala Kĕnĕring in Upper Perak. The skull was that of an old man who had been buried between three and four years.

The grave was completely concealed in the underwood and surrounded by primeval forest, and Dr Grubauer, who dug up the skull, says that he would have been quite unable to find it without the assistance of Penghulu Dakabo himself; in fact, the grave was still further concealed by a tree which had accidentally fallen across it, and which had to be moved before the tops of the "grave-posts" could be found. The latter consisted of a number of short posts planted in the ground diagonally, and leaning over the skeleton, so as to protect it from falling earth, the skeleton itself lying untouched beneath them.

The skull is a small one, with the mandible attached, and the sex claimed for it appears the correct one. The age of the individual must, again (as claimed), have been well advanced, as synostosis is observed in a marked degree in the coronal and sagittal sutures. No teeth remain in their sockets, but seven accompany the skull. Signs of alveolar abscesses are seen in the upper jaw. The whole skull is stained as though by some vegetable juice, which has imparted a yellowish tinge to the specimen. Vegetable fibres remain in the orbits, and in the foramina about the base of the skull.

As regards the general characteristics of this skull, it may be said at once that it does not present evidence of a low stage of evolution, and, indeed, in many respects it is as highly developed as many skulls of civilised Europeans. Evidence for a lowlier rank than these could only be demonstrated, if at all, by a very careful analysis of the morphological features of the specimen now in question.

The cranial portion of the skull is well filled and muscular ridges do not interrupt the uniformity of its contour. The individual cannot have been characterised by any great physical development. The brow-ridges are, however, quite distinct and impart much expression to the facial part of the skull. The skeleton of the nose is moderately prominent, and there is prognathism of the subnasal variety—*i.e.*, the alveolar border of the upper jaw is prominent. The specimen may now be considered from the several *normae* in order.

In *norma verticalis* the skull is brachycephalic and obovate in form. The zygomatic arches are just concealed by the skull-wall, and the specimen is, in consequence, cryptozygous, but on the borderland of phaenozygism. Synostosis has invaded the median parts of the coronal suture, and has almost obliterated the anterior three-quarters of the sagittal suture. Two parietal foramina are seen. Muscular ridges are, as have been mentioned, so feebly developed as to be hardly distinguishable.

In *norma lateralis* subnasal prognathism is seen. The naso-frontal depression is accentuated by prominent brow-ridges, above which the median sagittal curve of the skull rises abruptly, making the forehead appear high. The curve in question is continued without interruption to the inion, where there is a roughened area. The zygomatic arches are stout in proportion to the size of the skull, the mastoids being of moderate size. The sphenoid joins the parietal bone at each pterion.

In *norma facialis* there is seen a well-rounded transverse cranial arc; the face is wide, though absorption of the jaw accentuates this feature. The orbits appear of moderate height (though the index shews them to be micro-semic) with bevelled outer margins; the os planum of the ethmoid is of good height, and the lacrymo-ethmoidal suture of fair length (10 mm.). The lacrymal hamulus is absent from each side. The pars facialis of the infra-orbital suture persists on the left side. The nasal aperture is of moderate width, the nasal bones small and upturned, curiously like those of Australian aboriginals; the lower nasal margins indistinct. The nasal spine is at the end of a ridge (lophacanthic type).

In *norma basilaris* a long hypsiloid palate is seen, the tubera maxillaria are small; no teeth remain in the alveoli, and these are in many instances obliterated, owing to absorption of the jaw. The glenoid fossæ are deep, the tympanic bone is not perforated and is of fair length, the styloid processes variable, the right being long, the left short. A pterygospinous ligament must have been present in life. The foramen magnum has no special features, being quite comparable to that of the normal European skull.

In *norma occipitalis* an approach to a pentagonal outline is seen; there are two or three Wormian bones in the lambdoid suture, and a remnant of the suture dividing the inter-parietal from the supra-occipital element of the occipital bone is seen. On a plane surface the skull rests on the alveolar margins of the jaw and on the tips of the mastoid processes.

The mandible has a prominent chin, an obtuse angle and shallow sigmoid notches. The teeth are well worn, decayed, but not apparently filed.

Judged by the indices, the skull is to be described as short, flat, and broad-faced, orthognathous, with flattened orbits and narrow nasal aperture. The last character, however, is not properly represented by the figure of the nasal index, which is unusually low, owing to the remarkable position of the nasal spine. The skull is microcephalic as regards capacity.

MEASUREMENTS OF SKULL.

CRANIAL PORTION:		FACIAL PORTION:		INDICES:	
Maximum length ...	167	Basi-nasal length ...	96	Cephalic ...	85
Maximum breadth ...	132	Basi-alveolar length ...	96+	Altitudinal	82·6
Basi-bregmatic height	128	Nasi-alveolar length ...	62+	Alveolar ...	100
Horizontal circumference	482	Bi-zygomatic breadth	131	Facial (Kollmann's) ...	47·2
		Orbital height ...	34	Orbital ...	82·9
		Orbital width ...	41	Nasal ...	44·8[1]
		Nasal height	48		
		Nasal width	21·5		
		Capacity:—two determinations gave 1,245 c.c. and 1,250 c.c. respectively; 1,245 c.c. is the more correct figure			

[1] Falsified by great development of the nasal spine.

It presents some remarkable resemblances to a cranium in the Cambridge Ethnological Museum, which I described in *Man* (1902, 28): the shortness of the cranium and the general rotundity are alike in each, as is also the small figure of the cranial capacity. Where the Semang skull differs from the Andamanese skull just mentioned, it resembles a skull described by Turner as that of a Sakai, and figured in a communication to the Royal Society of Edinburgh (vol. xl, Part 1, No. 6). The Sakai skull agrees with the subject of the present account in the possession of prominent brow-ridges, and consequently flattened orbits, the nasal bones and aperture have similar characters

in each. But Turner's "Sakai" is dolichocephalic, so that the correspondence of type is not far-reaching. No very close resemblance can be traced between the Semang here described and the skull from Pahang described by Turner, or the "Pangghan" described by Virchow (see comparisons in "Some Anthropological Results of the Skeat Expedition to the Malay Peninsula," *Journ. Anthr. Inst.*, vol. xxxii, 1902, p. 142), or the Semang Skull in the Cambridge Collection.

To sum up, then, this specimen of a Semang skull is to be regarded as an example of the short type of Negrito skull, which is thus shewn to be variable in the essential characteristic of the relation of length to breadth. It still remains to be proved whether the long or the short skull is the original Negrito one, and at the present day there are seemingly to be found Negrito skulls in the Malay Peninsula which (by their form) link up the extreme long and short types.

LIST OF SOME OF THE PRINCIPAL SKULLS IN THE UNIVERSITY MUSEUM OF ANATOMY, OBTAINED FROM ANCIENT SITES IN THE COUNTY OF CAMBRIDGE, ETC.

	Character of skull			Total
	1 Long, narrow	2 Medium	3 Short, broad	
Barrington	4	0	0	4
Bartlow	1	0	0	1
Burwell	1	2	0	3
Barnwell	2	1	0	3
Barton Road	1	0	0	1
Chesterton (gravel beds)...	1	1	1	3
Huntingdon Rd. (Roman site)	2	0	0	2
Jesus Lane	2	0	0	2
Various (Queens' Coll., S. John's Coll., Sidney St)	7	3	0	10
Castle Hill	1	1	0	2
Chippenham	1	0	0	1
Comberton (near Roman villa)	1	0	0	1
Fulbourn (war ditches)	3	2	0	5
Girton (ancient cemetery)	6	1	0	7
Haslingfield	1	0	0	1
Hauxton (coprolite diggings)	31	15	0	46
Kingston ,, ,, ...	11	6	2	19
Litlington...	2	0	0	2
Madingley	1	0	0	1
Great Chesterford, Essex	1	0	1	2
Saffron Walden, Essex	1	0	0	1
Brandon, Suffolk...	23	23	5	51
Grand total ...	103	55	9	167
Percentages ...	61·6	33	5·4	100

Note:—The figures for the Brandon crania are admitted because this town is so near the border of Cambridgeshire as to be practically within the scope of this sketch. These figures are from measurements by Dr C. S. Myers of Caius College. They are thus to be clearly distinguished from the earlier figures which are estimates only, not supported by actual measurements, but which nevertheless will, it is believed, prove not far removed from the actual figures. The number of skulls of mean proportion will probably be increased when these estimates are checked by measurements, and the proportions will thus be nearer those obtained by Dr Myers for the Brandon skulls.

AN ANATOMICAL DESCRIPTION OF SOME SKELETONS FROM THE WAR DITCHES AT CHERRY HINTON.

The series comprises five nearly complete skeletons, with an isolated and imperfect skull. The state of preservation of the bones is good, but affords no clue to their age. In the present account the chief characteristics of the crania and skeletons are noted, and two tables record the principal dimensions of the skulls and bones.

Of the five skeletons two are of males, three of females. Of the former, one is that of a tall, strong man past the prime of life, the other that of a much younger and weaker man. Of the rest, two are skeletons of young females, one of an aged woman; of the two younger, the soundness and regularity of the teeth are conspicuous features, and in one case metopism is observed, the cranial capacity in this case being exceptionally large. The skeleton of the old woman is less perfect, so that the measurements are less valuable; the platycnemic condition of the tibiæ is to be remarked.

The tables of measurements indicate that the cranial capacity of these specimens is large; the absolute length of the skulls as a series, or individually, is considerable, and the breadth index shews that the series is dolichocephalic. All the specimens are dolichocephalic except two; of these one is just within the mesaticephalic group (75·1), the other at the upper limit of the same group (79·4). In each case the vertical or height index is lower than the breadth index, so that the series is tapeinocephalic.

All are orthognathic, the index in the case of one female skull being remarkably low. The series is leptorrhine, though in two cases the index (50) denotes a mesorrhine skull. In one case the nasal index is exceptionally low, but here posthumous deformation seems to have affected the shape of the facial bones. The other indices do not refer to more than one or two cases, and need not be noticed in detail.

The sacral indices place the males in the platyhieric division (as Europeans, this would be expected). Of the corresponding indices for the females, one is below 100, and so places this sacrum in the dolichohieric group (this sacrum is composed of 6 pieces).

As regards the breadth-height index of the pelvis, the mean for the two males places them in their proper position as Europeans, though the indices differ by 10 (83·8—73·7). The indices for the three females vary by very small amounts only: the average is rather too high for European females, indicating that these pelves are rather higher than usual, in proportion to breadth.

The brim index of the pelvis, as regards the males, is much lower than usual; in one case where it is 65·4, the amount of damage sustained by the pelvis makes the index of very little value. The brim index of one female pelvis only is available: this agrees well with the average figure quoted by Professors Flower and Turner; and the actual dimensions of this pelvis reproduce almost exactly the average dimensions deduced from eleven female pelves measured by Professor Turner[1].

The dimensions of the segments of the limbs may be here considered. The radio-humeral index shews that all except one male are brachykerkic. The exception is the weakly male already referred to, and here the index of 80·8 denotes a dolichokerkic limb.

With regard to the corresponding relation in the lower limb, all are brachyknemic, though the females are relatively longer "legged" than the males (using the term "leg" to indicate the limb from the knee to ankle). These specimens do not depart far from the average of Europeans as regards the intermembral and femoro-humeral indices respectively.

The femora and tibiæ were examined and measured in order to determine if the pilastered or platycnemic conditions are present; in one case, a young female, the femur is distinctly pilastered, and in one case, the aged female, the tibia is very distinctly platycnemic. The respective indices bear out this conclusion.

Finally, it must be admitted that it is hard to assign these skeletons to a definite race; but one may say with some confidence that they are post-Roman. By the process of exclusion, as they are not of the long barrow or round barrow races, nor of the broad-faced coffin-shaped type of the Saxons of Southern England, they must be either Belgic or Anglian, and hitherto there are no definite criteria upon which we can depend for distinguishing these.

[1] *Challenger Report*, ii. 34.

Details regarding the individual skeletons.

No. 1. The skeleton of an adult or aged male of considerable height, about 1690 mm. The skull has a somewhat prominent glabella, and marked bulging above the inion which is marked by a strong downwardly directed spine; other muscular crests and ridges are not so well marked; the massiveness of the hamular processes of the internal pterygoid plates may be noticed. The right jugular fossa has three compartments, and there are two on the left side. The upper molars have been lost and their sockets absorbed; they persist in the lower jaw. Synostosis in the cranial sutures is observed at several points. The bones of the lower extremity are large, the femur and tibia being massive, with strongly marked crests for muscular and ligamentous attachments; especially is this the case with the tibial eminence for the attachment of the ilio-tibial band. The right tibia bears an upwardly directed spur on its outer and anterior surface, about 20 mm. above the lower end. This spur is grooved on the inner side, probably for the long extensor tendon of the hallux.

The vertebral column deserves mention for the sharp spine surmounting the odontoid process of the axis vertebra, and also for the exostoses from the left side of the first lumbar vertebra, articulating with similar though smaller exostoses from the last dorsal and second lumbar vertebræ respectively.

The xiphoid cartilage is ossified almost completely, and is perforated centrally by an opening about 4 mm. in diameter.

No. 2. The skeleton of a young woman nearly 1580 mm. in height. The skull is long, and appears somewhat "coffin-shaped" in norma verticalis; there is pronounced bulging over the inion which is not well marked, other muscular and ligamentous attachments being but feebly developed. The apertura pyriformis of the nose is very narrow. All the teeth are sound, the third pair of upper molars have not long appeared. The mandible is strong with low angle.

The chief feature to be noticed in the skeleton is the inclusion of the 5th lumbar vertebra in the sacrum, which thus consists of 6 pieces, although the last lumbar vertebra is only joined to the lateral masses of the sacrum by bony tissue, the lumbo-sacral intervertebral disc persisting; the sacral index in this case is correspondingly low, as has already been noted. The dental index 41·4 may be noted as the only one available in this series; the skull being accordingly microdont.

No. 3 is the skeleton of a young female about 1460 mm. in height. The skull, like others of this series, has suffered some posthumous deformation by pressure. It is long, narrow, metopic, and remarkably capacious; the forehead is high and there is some tendency to approach the klinocephalic form, as a zone of flattening crosses the sagittal suture just behind the bregma. Bulging of the occipital region is marked. The occipital and sphenoid bones are not yet synostosed, so that the individual's age was about 20 years. The foramen magnum is large, the palate broad, and a perfect set of teeth present in upper and lower jaws. The nasal aperture is exceedingly compressed.

The limb bones in several cases have epiphyses still separate; the femur has a very wide and deep intercondylar notch; both femora are strongly pilastered. The pelvis has been much damaged; the epiphyses for the iliac crests have not yet joined those bones. The right hand, with the lower parts of radius and ulna, are missing.

No. 4 is the skeleton of a young male; the bones of the lower limbs from the knee downwards are absent. The skull has the lowest altitudinal index and the highest naso-malar index of this series, so that it is a low skull with projecting nasal bones and nasal processes of superior maxillæ.

The second upper pair of molar teeth have been lost, and their sockets obliterated, probably prematurely, to judge from the appearance of the other teeth. The skull is long and narrow, the inion marked by a sharp ridge, other crests for muscular or ligamentous attachments being but feebly developed. The sphenoidal spines however are large and sharp; the margin of the external pterygoid plate is serrated.

The bones of the upper limb are less massive proportionately than the femora, which are long and peculiarly wide and antero-posteriorly compressed, especially near the lesser trochanters, where there seems to be some sort of deposit on the exterior of the bones. The pelvis has been much damaged.

No. 5 is the skeleton of an aged female, and is about 1470 mm. in height. The skull is microcephalic, 1305 c.c. in capacity; synostosis has progressed some way in the sagittal suture. The mastoid processes are very small, the zygomatic arches slender, the canine fossæ deep.

The bones of the skeleton have been somewhat damaged, and the pelvis especially has suffered; the iliac crests have more than usually sinuous outlines. The other point to be noticed in this skeleton is the marked platycnemic condition of both tibiæ (*index* 69).

TABLE OF MEASUREMENTS OF SIX HUMAN SKELETONS FROM CHERRY HINTON.

I. The Skull.

No. of Skull ... ... Sex ... ... Age	1 Male Aged	4 Male Adult	6 Male ? Aged	2 Female Adult	3 Female Adult	5 Female Aged
Cubic capacity	1550	1615	1450 ?	1480 ?	1650	1305
Maximum length	193	187	189	188	195	180
Ophryo-occipital length ...	188	187	187	187	194	178
Ophryo-iniac length	183	184	175	180	192	176
Occipito-alveolar length ...	210	191	?	202 ?	196	189
Occipito-spinal length	200	188	?	198	199	183 ?
Maximum breadth	145	140	150	137	141	134
Bi-asterial breadth	117	109	102	110	113	107
Bi-auricular breadth	122	115	123	115	109	112
Bi-stephanic breadth	113	120	122	106	126 ?	114 ?
Minimum frontal breadth ...	100	95	99	96	107 ?	90
External bi-orbital breadth ...	107	98	103	105	109 ?	95 ?
Jugo-nasal breadth	98	92	?	96 ?	?	88
Minimum inter-orbital breadth	29	24	27	31	31 ?	20
Bi-malar breadth	115	112	?	?	113 ?	105
Bi-zygomatic breadth	137	128	?	?	?	118
Bi-maxillary breadth	91	94	?	84 ?	91	80
Ophryo-mental length	145	138	?	138	144	134
Ophryo-alveolar length	95	95	?	90	98	85 ?
Naso-mental length	126	112	?	118	117	111
Naso-alveolar length	73	70	?	71	71	60 ?
Basi-mental length	105	100	?	106 ?	110 ?	95
Basi-alveolar length	99	91	?	96	92	89 ?
Basi-nasal length	104	100	104	99	109	97
Basi-bregmatic length	136	130	143	133	136	130
Basion to obelion, length ...	137	128	144 ?	126	133 ?	128
Basion to lambda, length ...	121	114	127	113	117	118
Basi-iniac length	81	84	82	79	90	88
Basion to opisthion, length ...	37	38	34	36	39	38
Breadth of foramen magnum ...	30	31	31	30 ?	28	30
Orbital height	33	32	?	39	37	32
Orbital breadth	41	38	?	39 ?	38	33 ?
Nasal height	48	51	?	52	53	42
Nasal breadth	24	23	?	23	19 ?	21
Palato-maxillary length	56	50	?	52	54 ?	52 ?
Palato-maxillary breadth ...	?	55 ?	?	61	52	52 ?
Horizontal circumference ...	535	531	530	520	540	505
Horizontal pre-auricular arc ...	235	282	280	220	250	220
Horizontal post-auricular arc ...	300	249	250	300	290	285
Supra-auricular arc	308	313	326	312	316	297
Oblique parietal arc	372	363	330	367	375	352
Frontal arc	132	137	134	127	130	123
Parietal arc	133	129	135	134	131	120
Occipital arc, superior	72	68	65	72	60	66
Occipital arc, inferior	50	50	50	45	58	54
Jugo-nasal arc	115	113	?	106	?	98

I. THE SKULL.—*Continued.*

No. of Skull ... ... Sex ... ... Age	1 Male Aged	4 Male Adult	6 Male? Aged	2 Female Adult	3 Female Adult	5 Female Aged
Anterior palatine width ...	27	29	?	28	30	25
Posterior palatine width ...	?	40 ?	?	37	40	?
Lower jaw:						
Symphysial height	33	29	?	30	30	30
Coronoid height	67	67	?	63	62	54
Condylar height	64	55	?	59	51	56
Gonio-symphysial length ...	71	69	?	71	71	65
Intergonial width	109	101	?	104	97	82
Intercoronoid breadth ...	102	97	?	?	?	82
Intercondylar breadth external	125 ?	117	?	122 ?	110 ?	109 ?
Intercondylar breadth internal	85 ?	80	?	80 ?	85 ?	74 ?
Breadth of ascending ramus ...	34	39	?	35	39	30
Angle of ascending ramus ...	124°	113°	?	113°	124°	?
Additional measurements:						
Inter-pterionic breadth ...	115	112	101 ?	100 ?	122 ?	110
Choanal height	25	20	?	26	?	24
Choanal breadth	33	28	?	26	?	30 ?
Length, lac-ethml. suture, *R.*	?	?	?	?	?	?
Length, lac-ethml. suture, *L.*	12 ?	?	?	?	?	?
Length, sphen. parietal sut. *R.*	17 ?	14	?	?	?	9 ?
Length, sphen. parietal sut. *L.*	?	14	?	?	12	21 ?
Distance from ant. to post. nasal spine	56	53	?	52	58	50 ?
Least distance between temporal crests	94	121 ?	129	100 ?	?	?
Length of 3 molars combined	?	?	?	29	34	?
Length of molars & pre-molars	?	?	?	41	?	?
Indices:						
Cephalic	75·1	74·9	79·4	72·9	72·3	74·4
Vertical	70·5	69·5	75·7	70·7	69·7	72·2
Alveolar	95·2	91	?	97	84·4	91·8?
Orbital	80·5	84·2	?	100 ?	97·4	97 ?
Nasal	50	45·1	?	44·2	35·8 ?	50
Palato-maxillary	?	110	?	117·3	96·3?	100 ?
Facial, total	94·5	92·75	?	?	?	88
Facial, superior (Broca) ...	69·3	74·2	?	?	?	?
Facial, superior (Köllmann) ..	53·3	54·7	?	?	?	?
Stephano-zygomatic	82·5	93·75	?	?	?	?
Gonio-zygomatic	79·6	78·1	?	?	?	69·5
Naso-malar	117·3	122·8	?	110·4?	?	111·4

II. AVERAGES OF INDEXES.

	Averages of		
	All	Males	Females
Cephalic Index ...	74·8	75	73·2
Vertical Index ...	71·3	70	70·8
Alveolar Index ...	91·9	93·1	90·7
Nasal Index ..	47·4	47·5	47·1

III. The Bones.

No. of Skeleton	1	4	2	3	5	Averages of		
Sex	Male	Male	Female	Female	Female	All	Males	Females
Pelvic breadth	265	285	262	255	250			
Pelvic height	222	210	206	200	195			
Width between Anterior Superior Spines	237	240	213	225	220?			
Width between Posterior Superior Spines	52	70?	53	85	173			
Width between Tubera Ischii	143	105?	150	90?	150?			
True Pelvis: Transverse diameter of Brim	128	130	137	124?	?			
Conjugate diameter of Brim	90	85	107	97?	?			
Depth of Symphysis Pubis	40	45?	30	30?	?			
Sacrum: Length	121	100	120	98	107			
Breadth	121	120	110	105	104?			
Index	100	120	91·7	107·1	97·2?	104·7	110	99·4
Breadth-Height Index of Pelvis	83·8	73·7	78·6	78·4	78	78·5	78·75	78·4
Brim Index of Pelvis	70·3	65·4	78·1	?	?	71·3	67·85	78·1
Other bones of the skeletons:								
Scapula. Length	165	150?	151	?	?			
Breadth	112	105	98	?	?			
Index	67·9	70?	64·9	?	?	66·4	67·9	64·9
Humerus. Length	331	308	310	298	289			
Radius. Length	247	249	223	214	213			
Femur. Length	454	438	450	432	409			
Tibia. Length	353	?	340	343	332			
Radio-Humeral Index	74·6	80·8	71·9	71·8	73·7	74·6	77·7	72·5
Tibio-Femoral Index	77·75	?	75	81·25	81·2	78·8	77·75	79·15
Femoro-Humeral Index	72·9	?	68·9	70·6	70·7	70·8	72·9	70·1
Intermembral Index	70·4	?	64·9	66·9	67·7	67·5	70·4	66·5
Diameters at middle of shaft:								
Femur, Antero-Posterior	30	25	25	27	24			
Side to side	32	28	24	21	23			
Tibia, Antero-Posterior	31	?	29	23	29			
Side to side	24	?	22	23	20			
Index of Femur	93·75	89·3	104·2	128·6	104·3	104	91·5	112
Index of Tibia	77·4	?	75·9	100	69	80·6	77·4	81·6

AN ACCOUNT OF SOME ESKIMO FROM LABRADOR.

(With assistance from B. H. PAIN, Esq., B.A., Emmanuel College.)

IN the autumn of 1899 a party of 27 Eskimo were brought from Labrador to this country by an American gentleman, Mr Ralph G. Taber, and were exhibited at Olympia[1] during the latter part of that year and in January, 1900. The following account deals with the more important of their physical characteristics, and we are much indebted to Mr Taber both for the opportunities he afforded us of making measurements and for his courtesy in answering numerous enquiries about Eskimo-life in Labrador. The measurements were made by means of the following instruments: Garson's Anthropometer, Martin's Anthropometer and Callipers, Cunningham's Craniometer (for radial measurements), and the strengths of "pull as archer" and of the grasp of the hands respectively were recorded by means of the instruments in use in the Anthropometric investigations of the Cambridge Philosophical Society. Finally a phonograph was used to record some Eskimo words. The measurements are recorded in a table which follows this communication and some of the chief results are reproduced in a diagram which is compared with similar diagrammatic representations of other human races. The latter are taken from an article on Physical Anthropology in a recent number of *Knowledge* written by Professor Arthur Thomson of Oxford, to whom we desire to acknowledge our indebtedness for such comparative material.

It is convenient to mention here that in making the measurements our work was much facilitated by one of the Eskimo women, Esther Enutsiak, who acted as an interpreter; and finally, that owing to the thick and somewhat rigid sealskin garments of our subjects, some of the measurements proved very difficult to obtain with accuracy.

[1] The Exhibition Hall in Kensington, London.

These Eskimo comprise members of five families. Their native land is that part of Labrador which is situated in the region of E. long. 64° and N. lat. 58°; there has been in this neighbourhood for some eighty years a Moravian settlement called Hebron, and the missionaries have certainly influenced the Eskimo in this district very considerably: it may be added that the missionaries are also traders. To judge from the photographs of this part of Labrador the country is of a desolate and forbidding aspect: moreover communication by land is almost impracticable and trading or fishing vessels are only able to approach Hebron during a very short period in the summer months of the year. We may here mention that the University Anatomical museum received a few years ago a donation of Eskimo skulls from Hopedale (presented by Dr E. Curwen, St John's College): Hebron is as much as four hundred miles north of this place, but the physical type is probably very similar in both instances. These Eskimo thus belong distinctly to the Eastern group of their race with whom the Greenlanders are usually ranked, and so are to be compared or in some particulars contrasted with the "Central," and "Western" or Alaskan groups of this stock. There is, however, reason to believe that the Labrador Eskimo have been less subject than any of the other branches to foreign influences and admixture, and this consequently enhances the interest they possess from the standpoint of physical anthropology. It is a matter of great regret that they are so few in number; Mr Taber estimates at something under 2000 individuals the whole Eskimo population of an area in Labrador about equal to that of Great Britain; such paucity of numbers when taken into consideration together with the fact of their liability to many forms of disease may well cause the gravest apprehensions for their permanence. (For these diseases, &c., cf. Turner, *Annual Report of the American Bureau of Ethnology*, vol. xi, pp. 187 *et seq.*)

The appended figures will afford an idea of the average stature of males and females respectively, the difference being on the average about 80 mm. in favour of the former. But there is a considerable range of variety presented by the males, of whom Tapeka-Pinnit and Alukt-Mikiuk represent the highest and lowest extremes respectively. (Herein differing from the Ungava Eskimo—cf. Turner, *loc. cit.* p. 184.) The skin colour and complexion does not differ much in the two sexes, but was rather paler than might have been expected, though this is probably due to the conditions of life at Olympia, viz. in almost constant confinement indoors, and in exposure to the glare of electric arc-lamps (cf. Turner, *loc. cit.* p. 185). One or two of the men exhibit however a coppery tint. Freckling was not observed, but one woman had

several moles (naevi) on the face. There was no tatooing to be noticed. In all the men the hair of the head is abundant, thick and rather coarse, lank, and of a jet-black colour. It is cut evenly round the head just below the ears. The hair of the women is carefully braided, partings being made on the head in the transverse and antero-posterior directions, and the four masses of hair thus separated being gathered up into four plaits, which are looped around the sides of the head.

In the men a beard appears to be developed, but is comparatively late in appearing and never seems abundant. The moustache and whiskers are also of feeble development only.

These Eskimo are thus remarkably uniform in the characters presented by the hair both in amount and distribution: an exception must be made as regards *colour* in the case of a half-breed child (Nancy) in whom the hair is lighter. In other children the hair is quite as black as in the adults.

The colour of the eyes is even more constant, there being no exception to the rule that the iris is of a dark brown tint (though not quite black, as Keane says). In several cases, some conjunctivitis has occurred, and in one instance had been very severe, for it had produced extensive corneal opacity. Epicanthus is not quite constant and is only seen in one of five females: it is distinctly more frequent in the men (6 out of 10 possessing this characteristic fold).

The ears, though large, are according to the human standard well-shaped; the lobule is usually quite well-developed. The indices are recorded in the table and shew quite a "high" type of ear to be the rule.

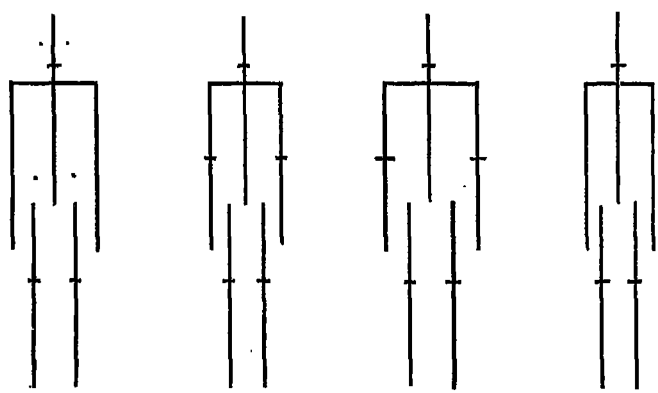
The nose is very flattened and the alæ wide, and thus the index is higher than one would expect from the cranial proportions of the nose, the cranial aperture of which is, on the average, narrower than in any other human race.

In comparing our results with the records of other observers, we find but little need for comment, for the Labrador Eskimo seem to present all the features previously regarded as characteristic of this hyperborean race. Our comparisons relate less to the external characters, such as skin and hair colour, than to the results of measurements. We have found the following the most important works of reference (Virchow, *Zeitschrift für Ethnologie*, Band xii, 1880; Boas and Turner, in the annual volumes vi and xi respectively of the *Reports of the American Bureau of Ethnology*, also Boas, in the *Zeitschrift für Ethnologie*, Band xxvii).

Taking these in order we note that Virchow's communication (*Zeitschrift für Ethnologie*) is of particular interest, for it records the principal characteristics of a party of eight Labrador Eskimo exhibited in Berlin

in 1880: these Eskimo came from Hebron and Nackvack, and whereas five had been partially educated by the Moravians, the remainder had never been subjected to any civilizing influence of European origin. It is therefore interesting to observe that one of these more primitive Eskimo became a prey to hysterical excitement of some violence, under the ordeal of being measured. Some of the members of this party were subsequently taken to Paris and unfortunately contracted small-pox with fatal consequences. In comparing the results of our observations with those of Virchow, we have to note a general concordance, with the following exceptions only. In the first place, the average stature obtained by us is rather less than the corresponding figure in Virchow's table: the smaller number of individuals at Virchow's disposal would have an important effect in determining this result. We would further suggest that the figure 1189 (mm.) which Virchow records as the span in the woman Bairngo, is very disproportionate. Secondly, Virchow notes a depth of cutaneous pigmentation which was not presented by our subjects. Finally it should be noted that Virchow's account is most elaborate, and includes psychological data: in the case of the Eskimo lately in London Dr Rivers will publish an account of their psychology.

In comparison with the Eskimo of Ungava Bay (about 200 miles from the home of our Eskimo) described by Turner, a greater variation in stature is observed by us; the apparent shortness of the lower limbs is a feature in each case, and the toes were noticed to be somewhat turned in during walking and the hands and feet to be relatively small in the Hebron Eskimo.



Boas' publication in the *Report of the Am. Bureau of Ethnology* is mentioned here for the sake of the valuable references to literature which it affords. The second publication, as reported in the *Zeitschrift*

für Ethnologie, 1895, gives figures for the stature of Labrador Eskimo which are very similar to those we obtained for males (i.e. 1575 (Boas)—1577) though a slight difference exists in the case of the females (1480 (Boas)—1497). Boas speaks of the great elongation and great height of the skulls of eastern Eskimo and this we noticed could be ascertained even in the living Labrador Eskimo: our figures for the cephalic index in the living do not however indicate so considerable a degree of dolichocephaly as the figures recorded by Boas. But we have dealt specially with the craniology of the Labrador Eskimo in a previous memoir (*v. supra*, p. 184).

It remains to refer to the diagram which embodies the results of measurements of 10 Eskimo males from Labrador: the other three figures are as follows: (No. 2) obtained from results of measurements of 10680 American soldiers, (No. 3) from 2020 male negroes, (No. 4) from 20 Aboriginal Australian males. Our figure for the Eskimo male from Labrador will be seen to occupy a position intermediate between the negro and the white man.

The illustrations accompanying this note are

Fig. 1. Shewing average Proportions of Male Eskimo from Labrador.
Fig. 2. " " " "Caucasian."
Fig. 3. " " " Negro.
Fig. 4. " " " Aboriginal Australian.

COMPLETE LIST OF AVERAGES.

	Measurement	Male	Female
1.	Stature	1577	1497
2.	Shoulder to Ground	1275	1182·5
3.	Tip of Middle Finger to Ground	568	580
4.	Patella to Ground	459·8	407·3
5.	Sitting Height	810	797
6.	Height of Auditory Meatus from Ground	1456	1406
7.	Height of Chin from Ground	1343	1292
8.	Span	1627·9	1447
9.	Biacromial Breadth	379	340
10.	Radii: Auriculo-bregmatic	140·4	133·5
11.	,, Auriculo-nasal	98·75	92·5
12.	,, Auriculo-alveolar	101·4	98
13.	Great Trochanter to Ground	868	—
14.	Strength (pull as archer) (67·2 lbs.) in Kgm. ...	30·48	
15.	Strength { Right Hand (grasp) (65·4 ,,) ,, ...	29·65	
	Strength { Left Hand (grasp) (63 ,,) ,, ...	28·57	
16.	Cranial Length	191·15	190·25
17.	Cranial Breadth	147·65	141·8
18.	Face: Total Length	127	116·5

	Measurement	Male	Female
19.	Face: Breadth	141·7	136·5
20.	Nasi-alveolar Length	73·15	69·35
21.	Jugo-nasal Width	116·6	112·25
22.	Jugo-nasal Arc	127·1	121·25
23.	Interocular Breadth	33·5	31·6
24.	Orbital Cavity, Height	34·9	36·6
25.	Orbital Cavity, Breadth	42·6	42·7
26.	Bigonial Breadth	131·2	126·2
27.	Ear: Height	67·5	63·6
28.	Ear: Breadth	36·1	30·2
29.	Head: Horizontal Circumference	559·5	547·2
30.	Head: Transverse Circumference	339	319
31.	Nose: Length	57·4	51·25
32.	Nose: Breadth	36·8	32

TABLE OF INDICES.

(From Measurements of Heads, not of Skulls.)

		Male	Female
1.	Cephalic (or Breadth)	77	74·5
2.	Altitudinal (or Height) (n. b. from auricular radii)...	73·5	70·7
3.	Alveolar (n. b. from auricular radii)	102·6	105·9
4.	Orbital	81·9	85·7
5.	Nasal	64·1	62·4
6.	Nasomalar	109·6	108
7.	Aural	53	47·4
8.	Kollmann's Facial	51·6	50·8
9.	Gonio-zygomatic	93·1	91·4

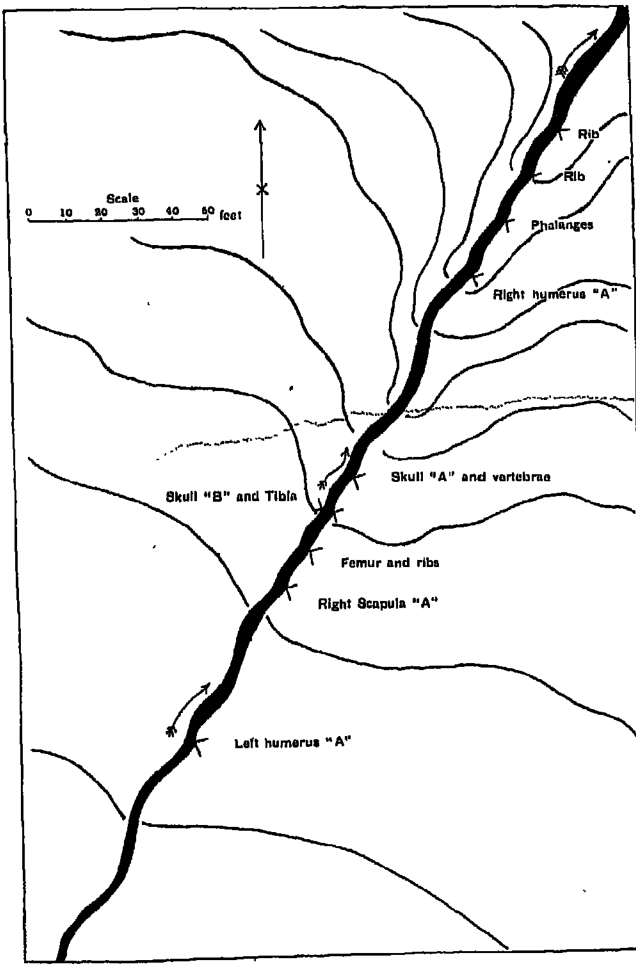
NOTE ON THE DISPERSIVE POWER OF RUNNING WATER ON SKELETONS: WITH PARTICULAR REFERENCE TO THE SKELETAL REMAINS OF PITHECANTHROPUS ERECTUS.

AMONG the objections raised against the acceptance of Dr Dubois' view as to the nature of the fossil bones found by him in Java and ascribed to an animal form intermediate between the apes and Man (*Pithecanthropus erectus*), there was one which disputed the community of origin of the several remains: it was urged in fact that since the distance separating the calvaria (skull-cap) and the femur was 48 ft. 9 in. (15 metres), the two bones could not have belonged to the same individual. Now it is very important, if not essential, for Dr Dubois' theory that the two bones should be regarded as having formed part of the same skeleton, and the objection was met by the response that experience would shew that the distance by which they were separated is not too great to preclude the possibility of their possessing a common origin in a single skeleton. It must be further explained that the remains were discovered in the bank of a river even now of considerable size, and that Dr Dubois suggests that crocodiles probably played a part in securing the dispersion of the bones of many of the animals which perished in the much larger pliocene representative of the modern Solo river.

The object in view in the present account is to shew that a stream of much smaller volume than the Solo river is capable of dispersing remains of skeletons over a distance considerably greater than the fifty feet or so required by Dr Dubois' theory. Incidentally two other points are illustrated by the specimens used in demonstration of this proposition.

In the northern part of Carnarvonshire there is a large marshy tract of upland some hundreds of acres in extent, situated immediately to the south-east of Penmaenmawr. This marshy plateau is drained by several mountain streams, the general direction of which is roughly east by

north. While walking over this eastern versant in the spring of 1901 I noticed a number of bones of animals dispersed along the line and in the bed of one of these streams, at that time of very small dimensions,



In the map the stream is shewn flowing upwards from left to right, and the thin lines are contours indicating the slope.

though probably melting snow in winter, or prolonged rains, would have increased it temporarily. At the time in question the width of the stream was about 4 feet.

The first bone I picked up was the right humerus of a horse, and I at once noticed in it indubitable signs of the disease known in human pathology as Osteo-arthritis and vulgarly as "Rheumatics." Struck by the reflection that one of the bones found by Dubois was also a pathological specimen, and that Virchow had discussed the possibility of Osteo-arthritis being the cause of the disease in that case (cf. *Zeitschrift für Ethnologie*, 1895), I determined to investigate the remainder of the bones, and in particular to endeavour to determine how far such fragments of the skeleton could be dispersed by such a comparatively small stream as I had before me.

Examination of the bones indicated that two, and only two animals, shewn by the characters of the bones to be small horses, had perished here. There seems no doubt that the animals had been mired in the marsh during the preceding winter, the state of the bones suggesting this limit of time. Furthermore, as numerous ponies roam in a semi-wild state over the neighbouring hills and marshy tracts, there is no reason to suppose that the animals had been specially brought to this spot to be destroyed.

The investigation was further simplified by the discovery that of the two animals, one was a young individual (between three and four years) and the other (the rheumatic one) aged. Thus the identification of the several remains was rendered much more easy than would otherwise have been the case.

The remainder of my examination resolved itself into pacing the distances between the various bones, and I contented myself with the observations embodied in the accompanying map; this shews the position of the more important parts of the skeleton of the older animal, which I have denoted by the letter "A"; the positions of one or two bones of the other pony "B" are also indicated, as well as some ribs and digital bones (phalanges) whose ownership was not determined with certainty.

I. The important point brought out by the observations is that the two humeri of the animal "A" were separated by a distance of 153 feet along the bed of this small stream. In comparison with this, the distance of 15 metres (48 feet 9 in.) demanded by Dr Dubois for the Javan bones can be granted without difficulty.

II. A few other points seem worthy of notice in this place. Firstly, the possibility of dispersion by wild animals was here excluded: the bones exhibit no signs whatever of having been gnawed by dogs, which are almost the only animals that could be suggested as responsible. Foxes are excluded for the same reason. Secondly, it will be noticed

that the ribs have been carried furthest down stream, no doubt owing to their lightness.

Again, if the distance of 153 feet from humerus to humerus should appear to prove too much, it must be mentioned that the course of the stream runs down at an angle of about 8° on the average; the small volume of water at work would thus be to some extent compensated.

III. The foregoing notes present the chief points of interest in connection with the subject in question. Two further remarks appear appropriate with regard to the bones themselves.

In the first place, the bones shew that the shoulder-joint of the pony "A" was in an advanced stage of the disease called Osteo-arthritis. Such an advanced stage of this condition is rare, though not unknown, in the horse. The subject derives a special interest from the point of view of the relation of disease to diet, whether in Man or the horse. A purely vegetable diet would not seem to be an efficient safeguard against the onset of Osteo-arthritis. This subject has been ably discussed by Dr Balfour in the *Edinburgh Medical Journal* (Feb. 1870, p. 713), where special reference to Osteo-arthritis in the horse is made. Again, Virchow (*loc. cit. Z. für Ethnologie*) describes a not dissimilar condition in bones of the extinct cave-bear (*Ursus spelaeus*) under the name of Hohlen-gicht. Evidence of similar conditions in early Tertiary ungulates was given by Professor Marsh at the International Congress of Zoologists at Leyden in 1895. Secondly and lastly, the water of this particular stream and marsh seems to have contained sufficient acid (whether vegetable or other) to lead to disintegration of the bones in certain places. This effect must be very carefully distinguished from those of Osteo-arthritis. In the latter, the joint-surfaces and the neighbouring parts of the bones will be affected, and in such a way that erosion and eburnation (polishing) of the joint-surface is found accompanied by bony outgrowth around the margins of the latter. Erosion due to acidity of the water first affects the very thinnest parts of the bones and is accompanied of course by nothing in the way of exostosis. The scapula of "A" shews both conditions very excellently, the joint region affording evidence of Osteo-arthritis as already said, and the blade of the scapula being perforated in its thinnest part by the solvent action of the water.

DENTAL ANOMALIES IN THE UNIVERSITY ANATOMICAL COLLECTION.

THE following notes have been drawn up as a first contribution to the description of dental anomalies in the crania in the University Museum of Anatomy. The specimens are arranged according to their provenance, under the following headings:

A. Teeth appearing in abnormal positions.
B. Accessory teeth.
C. Dental rudiments and accessory dental cusps.
D. Miscellanea.

Under A, the following examples are described:
(1) Canines displaced, Nos. 3268, 1943, 2114.
(2) Premolars displaced, Nos. 2980, 1226.
(3) Molars displaced, Nos. 1767, 1218, 1887.

Under B, the following examples are described:
(1) Teeth *in situ*, Nos. 1215, 1919, 2134, 3356.
(2) Alveoli for accessory teeth only, Nos. 1988, 1749.

Under C, the following examples are described:
(1) Rudiments or their alveoli; Nos. 3734, 3355.
(2) Cusps, Nos. 3369, 3325, 3344, 1733, 1731.

Under D, the following examples are described:
(1) Geminated teeth, Nos. 1114, 1968.
(2) Miscellanea, Nos. 1833, 1795, 3321.

A (1). DISPLACEMENT OF CANINE TEETH.

Catalogue No.	Provenance	State of Preservation	Age	Sex	Features of interest
3268	Egypt (native)	Good	Adult	? Male	The upper canine teeth are about to appear on the palatine surface instead of in their normal position. Cf. No. 1943 Peru, 2114 Australian, and a Negro skull in the Museum of the Roy. Coll. Surgeons, London.
1943	Peru (aboriginal)	Good	Adult	Male	A tooth, seemingly the canine, appears in the canine fossa, on the left side of the face: another tooth has made its way to the palatine surface. Cf. 3268 and also for references 2980.
2114	S. Australia (aboriginal)	Good	Adult	Male	The canine teeth have made their way to the facial surface of the maxilla; and on the left side a (?accessory) premolar tooth appears on the palate. Cf. 3268, 1943, and for references, 2980.

A (2). Premolars displaced.

Catalogue No.	Provenance	State of Preservation	Age	Sex	Features of interest
2980	Europe	Good	Adult	?	One upper premolar tooth having been crowded out, appears on the palatine surface. Cf. Nos. 1218, 1226, 1943, 2114, 3268.
1226	Hindustan	Good	Adult	Male	One upper premolar tooth having been crowded out, appears on the palatine surface. Cf. for references 2980.

A (3). Molars displaced.

1767	Soudan	Good	Adult	Male	The third upper (left) molar tooth has emerged on the facial aspect of the maxilla. Cf. 1218.
1218	Punjab	Good	Adult	Male	The third upper (right) molar tooth has emerged on the buccal aspect of the maxilla. Cf. 1767, 1887, and an Australian skull in Dr Haddon's collection: also an orang-utan skull in the Amsterdam collection.
1887	Jamaica prehistoric	Good	Adult	Male	The appearance is identical with the preceding.

B (1). Accessory Teeth.

1215	Hindustan	Good	Adult	Male	An accessory premolar tooth is seen on the left side of the mandible.
1919	Peru (aboriginal)	Good	Young	?	An accessory incisor tooth is seen embedded in the premaxilla, immediately behind the left median incisor tooth.
2134	S. Australia (aboriginal)	Good	Adult	Male	An accessory incisor tooth is seen on the right side in the mandible. Its small size suggests that it may be a retained "deciduous" tooth.
3356	N. Britain (aboriginal)	Good	Adult	?	An accessory full-sized premolar tooth is seen in the mandible on the left side. Cf. 1215.

B (2). Alveoli no longer containing Accessory Teeth *in situ*.

1988	Peru (aboriginal)	Good	Adult	Male	A pit (4 mm. wide) is seen behind each upper third molar tooth.
1749	Mobanghi (Congo, aboriginal)	Good	Adult	?	A pit similar to those seen in 1988, is seen behind the last upper molar of the right side.

C (1). Rudimentary Teeth, or Alveoli for the same.

Catalogue No.	Provenance	State of Preservation	Age	Sex	Features of interest
3734	Chatham Island (aboriginal)	Good	Adult	Male	Very small pits are seen in positions similar to those of No. 1988 (*q. v.*).
3355	N. Britain (aboriginal)	Good	About 9	?	The interest of this specimen is dependent on the discovery of a small dental mass occupying a pit on the alveolar margin (upper maxilla), and the left side, superficially to the point at which the second premolar is about to emerge. The significance of this occurrence is not quite clear; on the one hand the small mass may be regarded as homologous with certain dental masses of similar size and appearance, which are often found in adult skulls from New Britain, and which may represent a third premolar; on the other hand, the occurrence of this small mass in a skull of the age of that under consideration (8 or 9) may be thought to afford evidence that this (and similarly situated masses in adult crania) is but the remnants of the second molar of the milk series. Against this view may be urged the consideration that this mass is comparatively deeply embedded, like the root of a tooth, whereas in the process of removal of the deciduous teeth, the root disappears earliest.

C (2). Accessory Cusps.

Catalogue No.	Provenance	State of Preservation	Age	Sex	Features of interest
3369	N. Britain (aboriginal)	Good	Adult	Female	On each side of the upper jaw, the first molar tooth bears an additional antero-internal cusp on its lingual surface. The symmetry is very striking: also the resemblance in position of these accessory cusps to the more frequent varieties of the small dental masses previously described must be mentioned: it looks almost as though such isolated masses might in some cases become freed with the first molar tooth. Otherwise they may be regarded (as Dr Tims thinks) as constituting mere accessory cusps due to outgrowths of the cingulum and consequently of no great morphological value. It is perhaps worth mention that this skull has neither fossae nor dental masses in the unusual situation previously discussed (*v.* p. 19; for literature, cf. Windle, *Anatomischer Anzeiger*, 1887, Bd. II.).
3325	N. Britain (aboriginal)	Good	Adult	Male	The first upper molar tooth on each side bears a supernumerary cusp, precisely corresponding to those of 3369, but of larger size: small pits which probably once accommodated dental vestiges also occur in this skull.
3344	N. Britain (aboriginal)	Good	Immature	?Female	The second left upper molar tooth bears a supernumerary cusp, situated however externally or antero-externally: the foregoing examples (3369 and 3325) have been antero-internal in position. Cf. Windle, *Anat. Anz.* 1887. Bd. II.

Catalogue No.	Provenance	State of Preservation	Age	Sex	Features of interest
1733	S. Africa (Kaffir)	Good	Adult	Male	A supernumerary cusp is borne by the first upper right molar tooth: the cusp is internal and similar in appearance to those in 3369 and 3325: the condition is here uni-lateral.
1731	S. Africa (Kaffir)	Good	Adult	Male	The first upper left molar tooth bears a supernumerary cusp or vestigial tooth on the anterior surface of the antero-external root. The cusp is knob-like.

D (1). Geminated Teeth.

1114	Paestum	Good	Adult	Male	The teeth are a good deal worn. There remain the following: on the right side, the lateral incisor, canine, premolars, and first two molars, the second being very carious. The third molar has probably been destroyed in exhuming the skull. On the left side, the same teeth are present with the exception that the second molar is absent and has long been lost (*intra vitam*). Finally the third molar remains and it is the tooth which presents the interesting feature in the present connection, for at its root it bears a secondary (geminated) tooth, represented by an enamel-clad knob about 5 mm. in diameter projecting from between the lingual and postero-external roots of the third molar; moreover an additional cementum-clad mass crosses the root of the geminal element. The latter is directed straight backwards, and no usage of its enamel can be seen, so that it was of no use to the possessor. This specimen should be compared with the Peruvian skull No. 1968, where the secondary mass remains, though the tooth in connection with which it was developed (and which is also the third molar though of the right side), has been lost.
1968	Peru (aboriginal)	Good	Adult	Male	The noteworthy feature is the third molar on the right side: above the alveolar surface projects a small rounded knob, about 5 mm. in diameter: the alveolar margin has been broken away and shews that this tuberous mass projects from the end of a peg-shaped tooth, of which it represents the crown, embedded in the alveolus: the latter tooth-mass overlaps the terminal knob which rests upon it like an egg in an egg-cup. Moreover the long axis of the tooth is set obliquely, so that the crown, such as it is, is directed backwards and inwards instead of directly downwards. This is an example of Gemination and is of great interest in comparison with No. 1114, an Italian skull from Paestum; in the latter skull the third molar and its offshoot are both present: it seems as if in the present case only the offshoot remains, the molar having been partly destroyed and lost.

D (2). MISCELLANEA.

Catalogue No.	Provenance	State of Preservation	Age	Sex	Features of interest
1833	Greenland (Eskimo)	Good	Adult	Female	The right lower third molar tooth is of unusually large size.
1795	N. Zealand (aboriginal)	Good	Adult	Male	Lower jaw: three incisor teeth only: the absent one apparently being the left lateral. All the crowns are considerably worn down, those of the third molar teeth above and below having suffered the least. The first molar teeth on each side of the lower jaw are specially interesting. Though not apparently more exposed than the second molar or than the second premolar teeth, they have been much more abraded, and in addition, the crowns have been slightly inverted so as to bring the outer (labial surface) of the crown and even of the outer roots into play, so that the enamel has been lost on this side of the crown. Such a condition of the molars was, as far as I know, first described by Scott in Maori Crania (*Proc. N. Z. Instit.* 1895, 3) and occurs also among the Mori-ori (Chatham Islanders) with considerable frequency.
3321	N. Britain (aboriginal)	Good	Adult	Male	Unerupted teeth are distinguishable deeply implanted in the mandible, below the first molar tooth on each side.

NAMES OF AUTHORS, AND OF DONORS TO THE UNIVERSITY ANATOMICAL COLLECTION AT CAMBRIDGE.

GENERAL INDEX.

CAMBRIDGE: PRINTED BY J. AND C. F. CLAY AT THE UNIVERSITY PRESS.